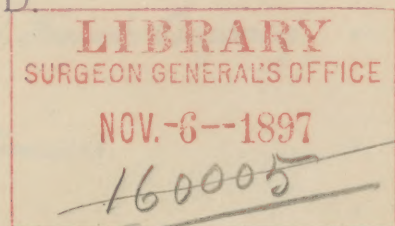


BRIEF NOTES
ON
The Conduct of Post-Mortem Examinations.
BEING
APPENDIX, A.
TO
A LABORATORY MANUAL
OF
PATHOLOGICAL ANATOMY
BY
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The Technique of Post-mortem Examinations.

Chapter I. Introduction

I. The report of a properly conducted post-mortem examination makes, in many cases, a valuable and important document. On the other hand an incomplete report of a poorly conducted autopsy is worse than useless as it not only gives no valuable information, but may even lead to the formation of erroneous conclusions. An investigation into the condition of a body after death is usually made for one of three purposes, either in the hope that the result of the examination will throw light upon obscure conditions, produced by the disease from which the individual died, and thereby widen the scope of our knowledge of the morbid changes which occur within the economy; or for the purpose of demonstrating pathological changes to students of medicine; or else the investigation is made at the instance of the State, in order that certain facts relative to the cause of death of the individual may be ascertained, upon which, not infrequently, rests the guilt or innocence of an accused party.

It can be readily seen therefore, that the opening statement just made, is not only strictly true, but that upon every one called upon to conduct a post-mortem examination there rests a degree of responsibility, that in certain cases may well render the operator extremely careful in his work.

In this country, where it is the exception for the State to appoint regularly qualified autopsy physicians, and to lay down certain rules and regulations for their guidance in conducting medico-legal autopsies, and where in consequence it frequently falls to the lot of the general practitioner to make such examinations, it behoves every one to fit himself as completely as possible for this oft-time exceedingly responsible duty.

The short account given in the few pages that follow, of the usual methods adopted in conducting an autopsy, will it is hoped be sufficient to guide the student in his work, it being understood that within the compass of short notes of this kind only the chief essential details can be pointed out, and the general lines of procedure laid down. Those who wish to go deeper into the subject and to thoroughly fit themselves for this sort of work are advised to consult larger works on the subject, a short list of which can be found at the end of this manual.

It is needless to say that every one before attempting to do autopsy work should be well grounded in normal anatomy, and be possessed of an accurate knowledge of the appearance of healthy organs and parts. In addition to this essential requirement, accuracy of observation, even to the smallest detail should be strenuously cultivated, for nowhere is the power to observe accurately more called for than while endeavoring to discover the various changes that disease or injury have produced in a body brought to one's examination.

To the above qualifications requisite to satisfactory post-mortem work may be added the ability to accurately and forcibly describe the conditions that are observed, so that any one reading the report of the autopsy would have presented to his mind accurate pictures of the various changes met with. Too much, otherwise good work is seriously marred by being carelessly recorded.

The best method for recording the results of a post-mortem examination will be given on a subsequent page. It should be remembered however that especially for the beginner it is important that every thing observed, whether it appear to him to be of importance or not should be carefully recorded, as it is only by increased experience that one can judge of what is and what is not important. A further end is also gained by systematically recording all that is observed, one forms the invaluable habit of observing, and observing closely.

and systematically so that in³ the end very little is apt to be overlooked. This habit, once established, is never lost. It should also be remembered that all normal conditions should be recorded as such, and the future reader of the report not be left to infer that parts were normal because they were not put down as being altered in any way.

Were the autopsies so frequently made in all our hospitals today carefully done and systematically recorded a large amount of valuable pathological material would be saved, and it is a fact very much to be regretted that "the wanton waste of valuable pathological material in many hospitals and public institutions at the present time on account of defective examination and imperfect record keeping reflects seriously upon the scientific interests and spirit of the attending medical and surgical staffs".*

At the time of making an autopsy the operator should dictate notes of such completeness that at some future time a full and readable account of the various conditions found could be made. For the purpose of making the preliminary notes in a regular order at every post-mortem, many institutions supply printed blanks that are filled out at the time of the autopsy, and from which the future report is compiled. In many instances these blanks when filled out form a sufficiently full report of the case and can be filed away in the hospital attached to the clinical records of the case. At other times, especially where a medico-legal report is to be made, the report made at the time of performing the autopsy should be as complete as is necessary, and this original document, signed by the one who performed the autopsy and dictated the notes and by the one who wrote the record should be presented to the Court, no subsequent additions, or alterations being made.

* "Post-Mortem Technique". Hektone.

II. Before describing the various steps to be followed in conducting the post-mortem examination it will be best to describe the instruments and other appliances that should always be on hand.

Instruments.

Knives:— 1. A section knife as first described by Virchow. This instrument should be in all about 24 centimeters in length, of which 9 to 10 centimeters should belong to the handle, and the blade being stout, broad and well rounded toward the point. (Fig. 1.) The handle should be such as can be readily grasped in the palm of the hand, for it should be understood from the start that in making post-mortem examination the knife should never be held as one holds a pen, between the thumb and fingers, but in such a way that when the arm is extended the knife appears as a direct prolongation. By holding the instrument in this way clean, long incisions can be made by drawing the knife firmly over the parts with a full arm movement.

2. A strong ordinary cartilage knife. This is chiefly used to sever the costal cartilages and to do other heavy work.

3. One or two ordinary dissecting scalpels to be used for the finer dissections.

4. A long, thin, broad bladed knife to be used in making sections of the brain and other large organs. (Fig. 2.)

Scissors:— 1. A pair of small probe pointed scissors to be used in opening vessels and small canals.

2. A pair of medium sized ordinary scissors.

3. An enterotome, (Fig. 3.) for opening the intestine, etc.

Measures:— One brass measure 20 centimeters long, divided into centimeters and millimeters.

One measuring glass holding 300 cubic centimeters for measuring the amount of fluids found in the various cavities of the body.

A set of graduated cones, (Fig. 4.) for measuring orifices, etc.

Two or three pairs of dissecting forceps.

4a.

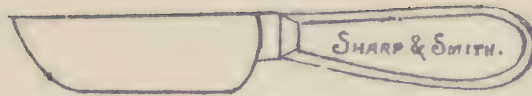


FIG. 1. Section Knife. (Virchow's.)



FIG. 2. Long Flat Double-Edged Knife for Sectioning the Brain.

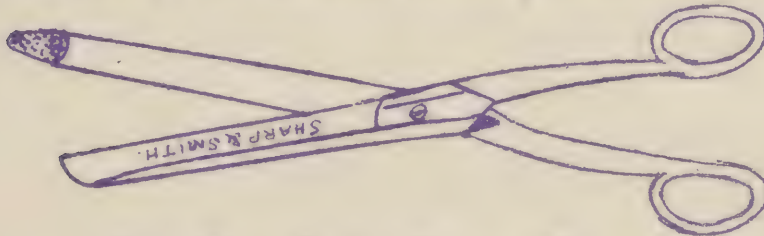


FIG. 3. Enterotome - (Proper Shape)

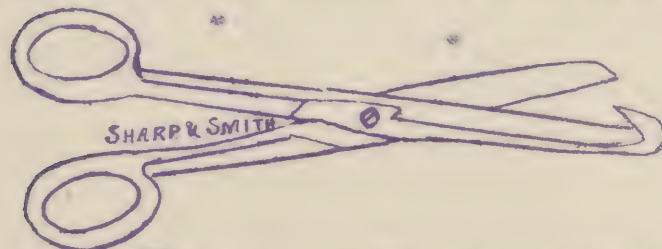


FIG 3' Enterotome - Improper Shape because the hooked end of the longer blade constantly catches in the tissues.

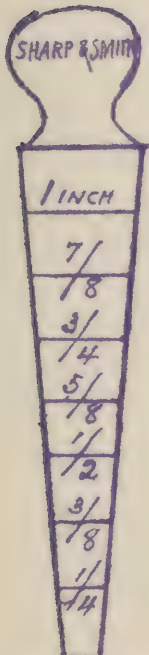


FIG. 4. Graduated Cone used to measure the size of orifices.



FIG. 5. Bone Chisel. (Rachitome).



FIG. 5' Brunetti's Bone Chisel, (Left & Right.)

A pair of scales and metric ⁵system weights, from 5 kilograms down.

A stout mallet.

One or more bone chisels

One bone saw. On an ordinary butchers saw will do.

One pair of bone forceps

Several post mortem needles and stout linen thread

Glass or porcelain dishes, jars, sponges, plates, magnifying glass, etc.

Reagents

III. It is always necessary, when one expects to save tissue from an autopsy, to have on hand in quantity, one or more preserving agents, into which small portions of tissue can be placed to harden for future examination. Of such reagents the ones mostly used and which give the greatest satisfaction are:-

Alcohol:- This should be used where the tissues are to be examined for micro-organisms and should be either absolute in strength or 95%. Alcohol however dissolves fatty substances and the coloring matter of the red corpuscles, and where it is desired to save these it is best to use the following:-

Formol:- This is a solution of formaldehyde in water and is found in the market as a 40% solution* which before use must be reduced by the addition of water to 5% strength. This reagent has the advantage of being cheaper than alcohol, and it also hardens tissue more rapidly and with less shrinking. I now use formol entirely, and it is my custom to allow small pieces of tissue to remain in this solution for a few days, after which they are removed, washed, and transferred to 80% alcohol where they remain till needed for examination.

For preserving portions of the brain and nervous system

* It also appears under the trade name of "Formalin"; and also as "Form-aldehyde".

it is sometimes advisable to use ^{6.} what is known as Müller's Fluid, although Formol can also be used, which is cheap and easily made*. A disadvantage of this reagent is that at first it must be renewed every day. When care is taken to change the fluid very often entire organs may be perfectly preserved.

Except where large portions of the tissue or whole organs have to be saved for purposes of demonstrating gross pathological conditions, only very small pieces should be taken as these harden more rapidly and with less shrinking, and from a very small piece of tissue a very large number of sections can be cut.

IV. If it is desired to make cultures from the fluids and organs of the body, one must have on hand a supply of culture tubes and platinum probes. For the technique of making cultures, and their subsequent care and study, the reader is referred to some work on bacteriology.

Chapter II.

The General External Examination

V. Before beginning any post-mortem examination, whether upon the body of one who has died under observation in a hospital, or in private practice, and about which practically everything that is of importance is known, or upon a body presented for autopsy for medico-legal purposes, the first thing to be done is to make a careful inspection of the cadaver and to record the same in as concise a manner as possible.

For purposes of convenience and to insure the completeness of the examination it is well to follow some definite order, and the following, or some modification of it may be employed.

* Müller's Fluid is composed of the following ingredients

Potassium bichromate	2 1/2 parts
Sodium sulphate	1 "
Distilled Water - by weight	100 "

1. Sex.
2. Race.
3. Apparent age.
4. Height.
5. Condition of nutrition.
6. Presence of Rigor Mortis.
7. How long dead.
8. Body Temperature.
9. Post-mortem lividity.

THE HEAD.

1. Color of hair.
2. Ears, discharge from, or foreign body in.
3. Nostrils, discharge from, character of.
4. Mouth " " " "
5. Color of mucous membranes.
6. Condition of teeth and gums.
7. Wounds, if present, character of.
8. Any peculiarities present.

THE NECK.

1. Sores, wounds, or enlarged glands.

ARMS AND HANDS.

1. Oedema.
2. Condition of the joints.
3. Deformities, tattoo marks, etc.

THE CHEST.

1. Development of.
2. Nutrition of.
3. Wounds, or scars of.
4. Condition of the breasts (female).

THE ABDOMEN.

1. Shape of.
2. Markings of, (linea albicantia).
3. Wounds, or scars of.

FEET AND LEGS.

1. Oedema.
2. Condition of joints.
3. Deformities, scars, character of, etc.

THE GENITALIA.

1. Development of.
2. Abnormalities of.
3. Discharge from (microscopic exam of).

VI. Respecting certain of the observations above mentioned a few words of explanation will not be amiss.

For example when wounds are found they should be examined for the direction in which they were probably inflicted. In suicidal wounds for example the direction is usually from left to right. An opinion as to whether a wound was probably self inflicted or not, should be made. Again bullets make different wounds of entrance and exit, which can be determined by the inversion, or eversion of their

margins, and frequently by the presence of particles of clothing in the wound of entrance if the wound be in a covered part.

It is not infrequently necessary to be able to state whether a wound has been inflicted before or after death, and the following table gives the chief characteristics of wounds that have been received some time before and some time after death.

Wounds made during life	Wounds made after death.
Edges everted due to the elasticity of the skin.	Edges of the wound in contact
Free hæmorrhage with effusion of blood into the surrounding tissues	Little or no hæmorrhage and no infiltration of surrounding tissues.
Clots in the vessels cut, or in the wound	No coagulum in the wound.
Signs of inflammation, healing or of gangrene	No such signs.

VII. Observations such as those upon the color of the hair, the presence of tattoo marks, peculiarities of structure, etc are chiefly of value for purposes of identification.

VIII. Rigor mortis which is due to post-mortem coagulation of the myosin of the muscle fibers usually commences within five or six hours after death and passes off in about twenty four hours, though it may persist longer. The disappearance of rigor mortis is due to beginning decomposition, so that whatever will favor this change will hasten the disappearance of post-mortem rigidity. Where death has been preceded by convulsions rigor mortis comes on quickly, but lasts only for a short time. This is especially well shown in cases of strychnine poisoning and tetanus.

IX Post-mortem lividity, so frequently noticed in dependent

portions of the body, is due to the transudation of blood serum and coloring matter from decomposed red blood corpuscles, from the vessels into the surrounding tissues. It is never noted in parts that come into actual contact with the bed. This lividity must be carefully distinguished from the discoloration produced by blood extravasation due to rupture of a vessel. An incision into the skin will in the latter case show the presence of blood clot.

NOTE:- It is sometimes important to be absolutely certain that a body is lifeless. The following signs may be relied upon as showing that life is extinct.

Absolute cessation of the heart's action and of respiration. Where for any reason there is doubt as to whether the heart is still beating it is only necessary to apply a tight ligature to one of the fingers, when if blood is still circulating, congestion beyond the point of ligation will be produced.

Dulling of the cornea is a sign of death.

Rigor mortis which disappears when the limbs are forcibly flexed or extended is also a sign of death.

Chapter III.

The General Internal Examination.

Order of Procedure.

X. In the present chapter we will begin the consideration of the general order of procedure, the method by which the body is opened, the various organs removed, and after removal sectioned for examination. The method really constitutes the technique of the autopsy and is of importance because organs faultily removed, will, as will be seen later, be useless either because they have been altered in the act of removal, or by being removed at the wrong time, or in the wrong way will have rendered the appearance of other organs

afterward removed so different ^{10.} from what they were that one is likely to be led to erroneous conclusions.

"In a systematic and scientific performance of an autopsy nothing is more difficult, and at the same time more important, than the insight into the reasons for pursuing a definite order of sequence in every detail of the examination. The course of the examination is usually dependent upon the order of succession. If for ordinary cases we require a definite process and a prescribed order, we do so not merely because such an arrangement is the surest guarantee for the completeness of the examination, and the best preventative against omitting important parts, but for the still greater reason that an unmethodical plan is the greatest obstacle to the subsequent collection of valuable reports. An unmethodical examination artificially and prematurely obliterates the existent condition of the parts." *

XI. The First Incision.

Standing upon the right side of the body, which should rest upon a metal, or stone topped table of such a height that the physician is not required to stoop over too far, and which is supplied with central drainage, the operator taking the section knife firmly in his hand, makes at a single steady stroke a cut extending from the centre of the notch in the upper border of the Manubrium Sterni to the Symphysis pubis, passing to the one side or the other of the umbilicus. This cut, in the region of the chest, passes as deeply as to the bone itself, while over the abdomen it only severs the skin and subcutaneous tissue, not passing through the fascia or muscles.

Now with the point of a knife carefully puncture the abdominal wall just below the ensiform cartilage, making an opening of sufficient size to admit the first and second

* Virchow. * Post Mortem Examination.

fingers of the left hand. With these fingers elevate the abdominal wall, pass the section knife between the fingers with its cutting edge up, and moving both hands towards the symphysis, open the abdomen along its entire length. By proceeding in this way, ^{one} avoids the danger of injuring the internal organs which exists if the body is opened by a second cut made as was the first.

In making the puncture below the ensiform cartilage notice whether there is an escape of gas, and whether or not, as the incision lengthens the intestines bulge up through the cut. If they do it indicates the presence of a considerable amount of contained gas.

XII. Should it be desired to make a bacteriological investigation of the peritoneum, or of the abdominal contents, tubes should be inoculated at this juncture, before the membranes or the organs become contaminated by further handling. After having inoculated such tubes as it is desired, the abdominal walls should be carefully drawn apart and a general inspection of the cavity made to note: -

1. Whether the organs occupy their normal position.
2. Whether there are any abnormal contents, such as tumors, fluids etc.

3. The general condition, color, etc. of the mesentery, peritoneum, etc. No organs are to be removed at this time, because by so doing it is impossible to avoid severing the large blood vessels, such as enter the liver, spleen, etc., thereby allowing the blood to escape from the main venous trunks, from the vena cava and thus from the right side of the heart, so that upon subsequently examining the organs, we do not find the conditions as they existed at the time of death, but possibly just the opposite.*

XIII. After having made the above observations the operator next

* Virchow, "Post mortem Examinations," page 18.

notes the position of the diaphragm on the two sides*. This is done by passing the right hand into the abdomen, over the surface of the liver on the right side and over the liver and spleen on the left till the highest point of the diaphragm is reached, with the left hand he notes upon the outside of the body, the rib, or intercostal space to which the diaphragm extends.

In the great majority of cases this can not be determined if the thorax is opened before the abdomen, or if after opening the latter we neglect to note the position of the diaphragm before opening the former, or before removing any of the abdominal organs, since in either case we can not avoid cutting through a portion of the anterior attachments of the diaphragm. It is in new-born children that it is especially important to ascertain carefully the position of the diaphragm since it is frequently of moment to be able to state positively whether or not the child has breathed and not only this, but but the extent to which the act has been carried.

XIV. Opening the Thorax:--

Before proceeding to a closer examination of the abdominal contents we now pass to the opening of the thorax and general examination of its contents. The reasons for this ^{partially} systematic proceeding has already been explained in a previous paragraph. (IX II, last half.)

Drawing the edge of the incision already made into the tissues of the chest, as far to the sides as possible, dissect away the muscles of the chest from their attachments to the ribs as far back on either side as can be conveniently done, disclosing the sternum, the costal cartilages and the ribs. Sever also the attachments of the abdominal muscles to the margins of the lower ribs.

* Normally the vault of the diaphragm reaches the fifth rib on the right side and fourth rib on the left side.

* The only deviation from this rule is in cases of poisoning where the whole interest in the examination centres in the stomach and intestines.

12
 Exchanging now the section knife for the stronger cartilage knife, proceed to remove the sternum in the following way, using considerable care not to injure the underlying organs by allowing the point of the knife to penetrate too far. Holding the knife firmly with its cutting edge up, sever the costal cartilages as close to their articulation with the ribs as possible, slanting the knife so as to give the cut surface of cartilages a beveled edge.

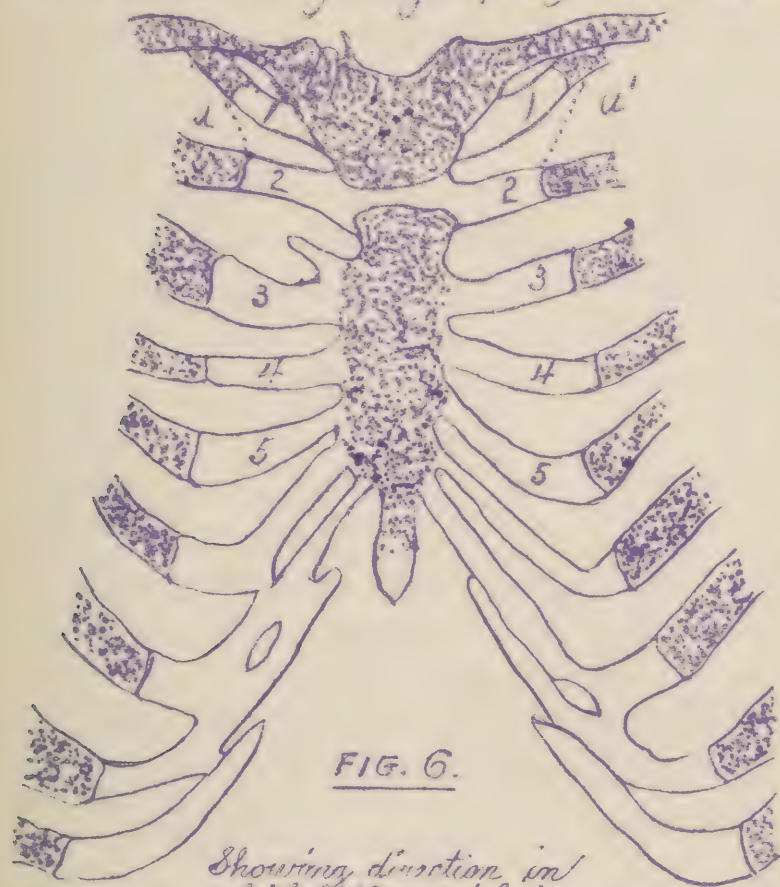


FIG. 6.

Showing direction in which knife must be turned to cut the cartilage of the first rib. See dotted lines a & a'.

Ordinarily no difficulty is experienced with this procedure until the first rib is reached and here the cartilage can be easily cut if, instead of continuing the incisions in the same line, the knife is slanted outward at an angle of about 30° (Fig. 6.)

Taking again the section knife direct the assistant to grasp the lower end of the sternum and cut cartilages, and gently raise the same while you dissect away the anterior attach-

ments of the diaphragm, being careful not to enter the pericardial sac which lies close to the under side of the sternum. As the tissues are severed from their attachment to the sternum care must be taken not to cut into any of the larger blood vessels especially the internal mammary, the internal jugular and the innominate, for by so doing fluid, or coagulated blood would escape and sooner or later find its way into one or both pleural cavities, in which event it would be obviously

impossible upon examination to state whether or not, in case these contained fluid, it had been bloody previous to opening the thorax, and it is necessary to point out how important it is in helping to form an opinion of a case, to be able to demonstrate positively the presence or absence of any foreign substance in these cavities.

The sternum is finally completely removed by passing the knife through the sterno-clavicular articulations, which procedure is facilitated by directing the assistant to draw it strongly to the side opposite to the one which is being disarticulated, in this way widening somewhat the space through which the knife has to pass. After separating the articular surfaces the knife is directed outwards and slightly upwards, parallel to the clavicle, so as to cut thro' the rhomboid ligament.

In cases where, due to old age or disease, the costal cartilages have become calcified, it is necessary, to use the bone forceps, or the saw in cutting them.

Having now opened both the chief body cavities, it only remains to note the following points relative to the contents of the thorax before proceeding to remove and further examine the various organs.

1. Their relative position.

A. Lungs

B. Pericardial sac, also its shape and size.

2. The presence or absence of any foreign body

C. Tumors

D. Fluid, pleuritic or pericardial, and the character of the same.

3. The color of the exposed parts, especially of the pleura and pericardium, and the presence or absence of adhesions between these membranes and the organs which they surround.

Chapter IV.

Removal and Opening of the Heart.

XV. Up to this point we have considered only the general observations that are to be made upon the surface of the body under examination, the method of opening the same preparatory to the removal of the organs, and the chief points to be noted in connection with the contents of the chest and abdomen before such removal. Before taking up the subject of the detailed examination of the organs of the body let us see how these are most readily and systematically removed, for as we have already seen (Par. X and XII) there should be some system adopted whereby the removal of one organ does not interfere with observations that have to be subsequently made in other organs or parts. The necessity for such an order was pointed out in the case of the abdomen, where it was stated that none of the abdominal organs were to be removed before the chest had been opened and the heart examined, since such removal would necessitate the severance of several of the larger abdominal vessels whereby blood would be allowed to escape from the right side of the heart, leading to erroneous conclusions when that organ was afterward examined. The same thing holds true also of the remaining thoracic organs, the lungs, and while at first sight it would appear most natural to remove and examine these organs first, we see that this can not be done, and our examination therefore begins perforce with the heart itself which before removal should be partly examined in situ.

After we have opened the pericardium and determined its condition as mentioned in Par. XIV.; we ascertain the following facts about the heart:

1. Its Position
2. " Size,
3. " Color,

4. Its Shape
5. " Consistency
6. The amount of blood in superficial
Coronary vessels

7. The amount of fat about the organ.

The organ is now removed by cutting the aorta, pulmonary artery and veins, and the vena cava, all of which have ^{been} previously ligated. After removal it is opened for examination.

The chief points to be determined on opening the heart are (1) the quantity and condition of the blood in its various cavities; and (2) the condition of the auriculo-ventricular orifices.

"The determination of the quantity and quality of the blood contained in the different parts of the heart is of decisive importance for ascertaining the kind of death. It is in the highest degree probable, even if not absolutely certain that two of the most important kinds of death, that from asphyxia and that from paralysis of the heart, occur in consequence of the overfilling, in the first case of the right ventricle, and in the second, of the left." *

In order to secure the blood within the heart for measurement it is necessary to make four incisions, one into each cavity, and since we wish also to learn the exact condition of the ^{tricuspid} valves and the valves which close them, the general position of these, which we may call "primary incisions" is practically determined for us since they must be so situated as not to injure any of the valves at the base of the heart, their cordae tendinae, or the papillary muscles.

The following incisions are therefore made:—

- (1.) Right Ventricle:— Begin close to the base of the right border. Pass the knife into the interior of the ventricle and continue the cut nearly to the apex, being careful not to cut into the septum. (Fig. 7.)

- (2) Right Auricle. - Begin half way between the entrance of the venae cavae and end just in front of the base.
- (3) Left Ventricle. - Begin close to the base to the left of the mitral valve and continue almost to the apex. (Fig. 7.)
- (4) Left Auricle. - Begin at the left pulmonary vein and continue to just in front of the base at a point usually indicated by a very prominent coronary vein.

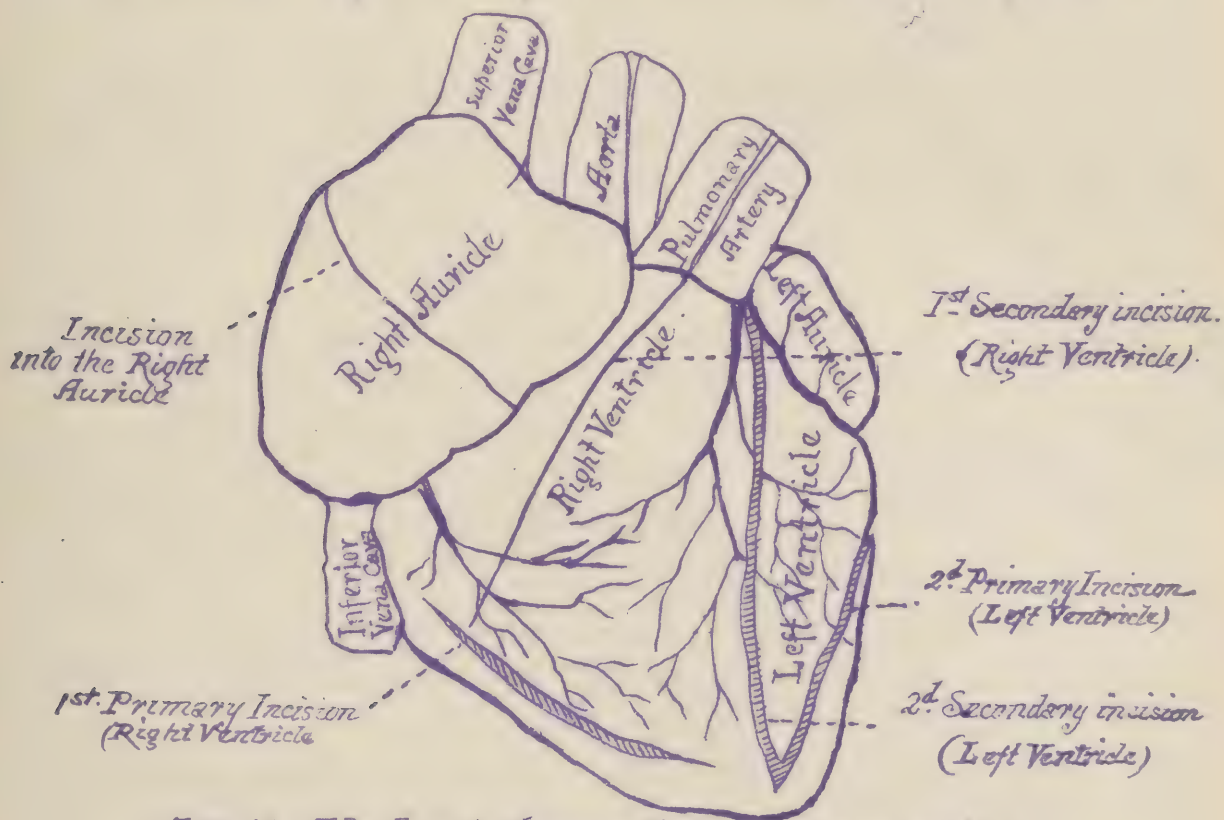


FIG. 7. The heart showing the two primary and two Secondary incisions into the Ventricles and the incision into the right auricle.

These cuts should for convenience be called the "primary or first incisions" for each cavity to distinguish them from others that are to be made later into the two ventricles. After making these carefully remove the blood from each chamber of the heart, determine its quality, whether fluid or clotted and measure it, after which measure the size of the mitral and .

tricuspid orifices with the graduated cone, being careful not to remove from the valve segments any vegetations which may be present by rough handling.

The "first act" in the examination of the heart is now finished, and the "second act" consists in making the following observations.

- (1) Examine the cut openings of the aorta and pulmonary artery to determine their size and the thickness of their walls.
- (2) Examine the closing power of the aortic valves by pouring water into the aorta while the heart is suspended.
- (3) Do the same with the pulmonary valves, in both cases being sure that no coagula attached to the valve segments prevent their closing.

The "third act" in examining the heart begins now with the opening of the two ventricles by what we may term the "secondary incisions," which are made in the following way:

- (1) Right Ventricle.—Begin at the cut end of the pulmonary artery and continue to the end of the primary incision already made, near the base. This incision should be made with a pair of scissors, care being taken not to injure the anterior papillary muscle of the tricuspid valve. (Fig. 7).
- (2) Left Ventricle.—Begin at the cut end of the aorta and continue close to the septum ventriculorum to the end of the primary incision already made near the apex. Care must be taken not to injure the base of the mitral valve on the left side, and not to cut into the pulmonary valves on the right. Carry the incision midway between the pulmonary orifice and the left auricle. (Fig.)

In concluding the examination of the heart we have to make the following observations:

- (1.) The condition of all the valve segments.
- (2.) " measurements of the pulmonary and aortic valves.
- (3.) " thickness of the right and left ventricular walls.
- (4.) " depth and breadth of the ventricular cavities.
- (5.) " condition of the endocardium.
- (6.) " condition of the coronary vessels.
- (7.) " condition of the intima of the aorta and pulmonary artery.
- (8.) " presence of blood clots and their character, whether anti- or post-mortem. (for differences between these two forms of clots, see Lecture Notes, chapter on Thrombosis.)

All of the observations above mentioned should be carefully recorded.

Chapter V.

Removal of the Remaining Organs of the Thorax & Abdomen.

Removal of the Lungs.

XVI. Usually the removal of the lungs is a simple matter and presents few difficulties. Occasionally however these organs are found to be more or less firmly adherent to the chest walls because of previous inflammation of their pleural coverings which has led to the formation of more or less firm fibrous adhesions. When this condition of things is found it is frequently difficult to remove the lungs without injury to them or to the pleural membrane that covers them. When the adhesions are recent and fibrinous in character (the result of pleurisy) they are easily broken, but when such inflammation has led to the development of bands of fibrous tissue, the adhesions are sometimes extremely tough, and the pleura so much thickened that it has lost all semblance to the delicate membrane that normally covers the lungs. In this latter case the bands of fibrous tissue may

have to be cut in order to remove the lungs without injury, as any attempt to break them by force would result in tearing the pulmonary tissue. These dense adhesions and great thickening of the pleura are most frequently found at the apices and in cases of tubercular disease of the lungs. In the removal of such an adherent lung it is frequently necessary for the operator to stand temporarily on the left side of the body.

After completely separating all adhesions the lungs are removed by cutting across the large bronchi and vessels at the root of each, avoiding any injury to the oesophagus and aorta. Some operators remove the lungs, oesophagus and aorta in one piece by cutting across these structures just below the clavicles, inserting the index finger of the left hand into the trachea, and while making traction, dissecting them away from the spinal column. After removal in this way the various structures are separated before examination.

Removal of the Intestines.

XVII. In emptying the abdomen it is best to begin with the intestines, for after their removal all the ^{other} organs are more easily seen.

The omentum is the first object met with on attempting to remove the intestines, it is usually spread out over the abdominal contents extending almost to the symphysis pubis. It may however be found rolled up just below the stomach. Turn the omentum back over the chest and then proceed as follows:-

- (1) Find the duodenum below the point of entrance of the common bile duct. Apply a double ligature and cut the intestine across between these.
- (2) With the aid of an assistant holding the small intestine, "strip" it of its mesentery by cutting the same away close to its attachment to the intestines, being

careful not to injure the gut.

- (3.) When the caecum is reached draw it well toward the middle line of the abdomen. Separate the peritoneum and fibrous tissue on the right side, and pull up on the ascending colon cutting its attachments also. Toward the upper end of this portion of the intestines care must be taken not to cut into the portion of the duodenum left attached to the stomach.
- (4.) Turn down the omentum and free it from its attachments to the transverse colon and stomach.
- (5.) Draw the transverse colon well toward the middle line bringing the splenic flexure into view.
- (6.) Free this portion of the intestine from surrounding tissue and follow it down, past the sigmoid flexure to the rectum.
- (7.) "Milk" the contents of the rectum backward into the sigmoid flexure, ligate the rectum with a double ligature, cut it across and remove the intestines which are now entirely free.

Removal of the Stomach, Duodenum & Pancreas.

XVIII. Before removing the stomach and duodenum, the latter should be opened, the opening of the common bile duct found, and if deemed necessary this ^{passage} should be explored as far back as the gall-bladder.* One may determine whether these passages are free by simply pressing on the gall bladder strongly when if no obstruction exists bile will be forced into the duodenum. This should always be done.

In order to remove the stomach it is only necessary to free the oesophagus from its attachments to the diaphragm, sever the common bile duct and free the organ from all surrounding tissue. It may now be lifted out with the duodenum and pancreas attached.

* In cases of poisoning a careful examination of these ducts can not be made.

Removal of the Spleen

XIX. This organ is found just below the diaphragm on the left side of the abdomen. It can be easily removed by drawing it carefully down with the left hand while with the right it is freed by a few cuts from any adhesions to the diaphragm or surrounding parts, its attachment to the tail of the pancreas having been already cut in removing that organ. It is often necessary to handle the spleen with great care as in a variety of morbid conditions it becomes so soft and friable that it is easily torn.

Removal of the Liver.

XX. Before removing the liver the adrenal bodies should be taken out as there is danger of removing a portion of the right one with the liver to which it lies in close proximity. While the assistant raises the liver cut all its ligaments, break any adhesions that may exist between the right lobe and the diaphragm, where they are not infrequently found, after which the organ can be lifted out.

Removal of the Kidneys

XXI. Before removing the kidneys, the last organs left in the abdominal cavity, find the ureters and trace their course from the bladder to the kidney pelvis, noting any twists, kinks, dilations or strictures that may be present. To remove the kidney simply "shell" it out of the fat and connective tissue that surrounds it cut the ureter and renal vessels at the hilum.

Removal of the Testes.

XXII. The testes should be removed before the pelvic viscera since by pursuing this order the normal relation of the parts is not disturbed. First find the vas deferens as it passes out

of the true pelvis and follow it to the internal ring. Should this structure not be easily found, as is the case where the pelvic contents have been already removed, find the spermatic veins which lie just beneath the peritoneum, and follow them to the internal ring. Here pick up the spermatic cord and pulling gently, upon it draw the testicle into the abdominal cavity. Should there be difficulty in getting it through the rings these may be enlarged with the knife.

Possibly a more rapid, but less satisfactory way of removing the testicle is to push it out of the scrotum into the canal and so through into the abdomen, freeing it of whatever coverings of the canal hinder its progress. Usually on the removal of the testis the scrotum is seen to be invaginated. This is due to the fact that the tunica vaginalis is attached by connective tissue to the bottom of the scrotum.

Chapter VII.

Removal of the Male Pelvic Viscera.

Removal of the Female Pelvic Viscera.

XXII. By the male pelvic viscera we understand the bladder, prostate gland, rectum and urethra. The removal of these organs usually presents considerable difficulty, chiefly on account of the limited space in which one has to work. The following steps are to be taken:

- (1.) Pull the bladder upward with the left hand and at the same time cut it away from the anterior abdominal wall, and from the back of the pubic arch, dissecting under the arch somewhat so as to free the prostate gland.
- (2.) Do not sever the urethra at this point, but free the bladder from all connections to the sides of the true pelvis.

- (3) Draw the rectum toward the bladder and cut it away from the sacrum.
- (4) Cut the rectum away close to the anus.
- (5) Now lift up the pelvic viscera; pass the knife behind the pubic arch; cut across the urethra and having thus severed all attachments, remove the various organs.

XXIV. It sometimes happens that one desires to remove the entire genito-urinary tract in continuity, and in this case the method of procedure is entirely different from that just given for the removal of the pelvic organs alone.

One of the most frequent reasons for the removal of the entire genito-urinary tract in continuity is to enable the operator to follow up the changes that have been produced in the various portions of the tract by a long standing urethral stricture. This condition of the urethra is not infrequently accompanied by serious secondary changes in the bladder, ureters and kidneys. Pressure on the urethra by an hypertrophied prostate gland may also lead to secondary changes in the other organs. In the removal of the various organs in continuity the following steps are to be taken:

- (1.) Free the kidneys from all attachments.
- (2.) Free the ureters in like manner from the kidneys to the bladder.
- (3.) Place the kidneys with ureters attached one on each side of the body while the rectum, and bladder are freed as just described in section XXIII.
- (4.) Continue the first incision made in opening the body (Sec. XI) over the symphysis and along the dorsum of the penis.
- (5.) Separate the skin from the penis.
- (6.) Cut across the penis just back of the corona, leaving the glans attached to the skin.

- (7.) Dissect the penis away from the under side of the pubic arch and divide the crura of the penis close to their attachments to the rami of the ischia.
- (8.) Push the penis, when freed, through the opening just made, into the pelvis.
- (9.) Draw up the penis and bladder and free the prostate from its connections.

The kidneys, ureters, bladder, rectum, prostate gland & penis can now be lifted out.

Removal of the Female Pelvic Viscera.

XXV. In the female the pelvic contents consist of the ovaries, tubes and ligaments, uterus, vagina, bladder, rectum and urethra. These organs are removed in the following manner:

- (1.) Cut away the bladder from the pubes and rami of the pelvis as described for the removal of this organ in the male. (Section XXIII.)
- (2.) Free the rectum from its attachments to the sacrum as described in section XXIII. for the male. This leaves the entire viscera attached to the floor of the pelvis only by the orifices of the rectum, vagina and urethra.
- (3.) Unless there is reason, which there rarely is, for wishing to remove the labia minora with the vagina, it is only necessary now to cut away the rectum, vagina and urethra close to their orifices.
- (4.) Sever the attachments of the broad ligaments on either side and ^{the} uterus, ovaries and tubes may be removed with the other pelvic organs.

Chapter. VI. (a)

Removal of the Brain & Spinal Cord.

XXVI.

The removal of the organs of the central nervous system, the brain and spinal cord, presents difficulties not encountered in the removal of the other organs for the double reason that they are very easily damaged because of their delicate structure and are in addition encased in thick walled bony chambers which it requires no inconsiderable force to enter, the use of which is only too apt to injure the contained structures. As difficult as the operation is it frequently has to be performed, though as a rule it is not necessary to remove the brain and spinal cord unless the patient showed symptoms of organic nervous disease pointing to lesions in these organs, or died from obscure causes.

The brain is removed in the following manner:

XXVII.

Opening of the Skull.

Slightly elevate the head by placing a block of wood beneath the neck. This block should be about 3-4 in high. If the body is that of a woman carefully unbraid the hair, and parting it from ear to ear and make a transverse incision from one mastoid process to the other. Draw the scalp forward, turning it inside out, so far as to disclose the superciliary ridges, and backward in the same way beyond the occipital protuberance.

The skull-cap is now sawn through, the cut being started just above the superciliary ridges, high enough to pass above the orbital plate of the frontal bone and continued backward and downward on each side to a point just above the base of the mastoid process.

Turning the head first on one side and then on the other, the ends of these incisions just made above the

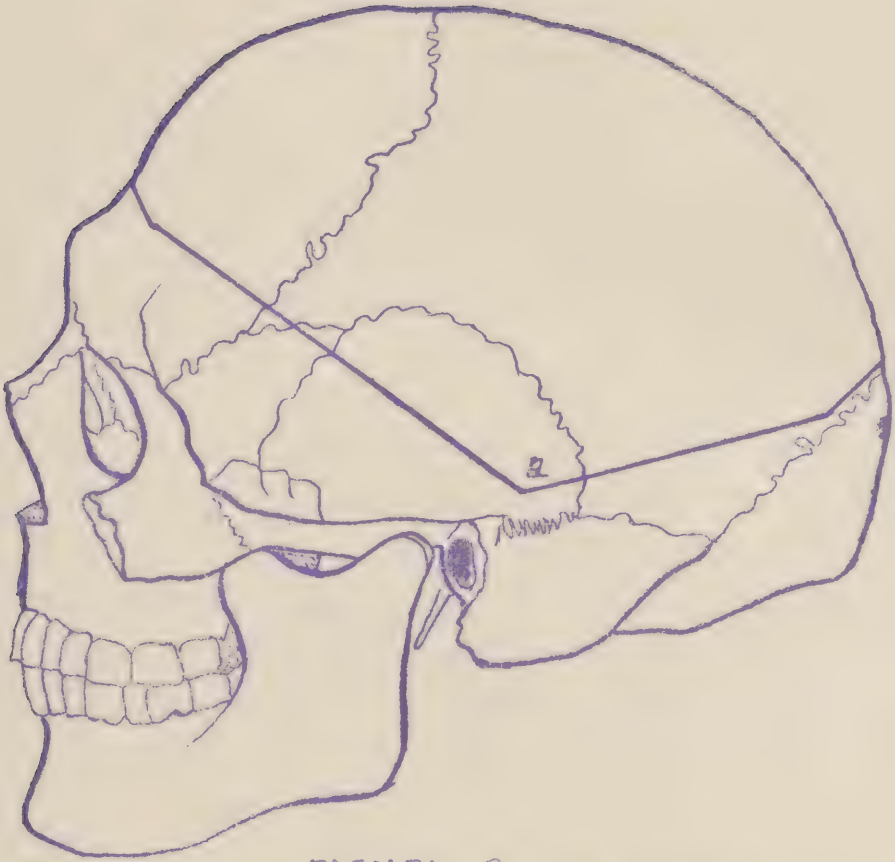


FIGURE 8.

Showing the incisions made in the skull for removing the skull-cap. The lateral incisions from an angle at a which prevents the cap from slipping when replaced.

mastoid process are joined by two saw cuts made in a back ward and upward direction, so that they meet at the occipital protuberance. The result of these second incisions is the production of an obtuse angle upon each side of the skull with the apex pointed downwards, and located just above the base of the mastoid process. Into these the skull-cap fits and when replaced after the autopsy it is thereby prevented from slipping backward and producing unsightly deformities of the head.

In making the cuts with the saw the bone only should be sawn through, the dura mater left intact. After the completion of the above mentioned incisions the skull should be pried up by the hand, hook, or by the handle of the post-mortem hammer. The use of the hammer and chisel for this purpose should be avoided if possible, especially in medico-legal cases, for there is always a liability of producing fractures by their use. If as sometimes happens, in children and especially in the aged, the dura mater should be found adherent to the inner plate of the skull the skull cap should be slightly raised and the dura mater divided around the edges of the saw cut with a pair of scissors.

XXVIII.

Removal of the Brain

Having carefully removed the skull-cap, and where necessary, the dura mater from the brain, introduce the first finger of the left hand beneath the frontal lobes and lift the brain up from the base of the skull. With a medium sized scalpel divide all the vessels and nerves as they appear at the base of the organ as closely to the bone, or dura mater as possible. When this is done raise the brain as high as possible and passing a small knife far down each side of the medulla first divide the vertebral

arteries and then cut the cord across. The brain is now free and can be lifted out.

XXIX.

Opening of the Spinal column.

Place the body on its ventral surface and make an incision in the median line from the occipital protuberance to the upper border of the sacrum. Carefully remove all the muscles from the spines and laminae by reflecting them to either side. After having done this and before proceeding to open the spinal canal carefully examine for any signs of fracture or dislocation, and note any peculiarities of the vertebrae that may be present. At times dislocations may be present which are not readily recognised from behind and it is therefore always wise to examine the bodies of the vertebrae from in front, after having removed the organs of the thorax and abdomen.

Begin to enter the spinal canal by sawing through the laminae on either side, being careful to direct the saw downward and inward, for otherwise, if the saw is directed only downward it may pass entirely without the canal. Sometimes, after having made an entrance at one point it may be more rapidly opened by severing the remaining laminae with a pair of forceps. These are usually necessary at any rate to cut through the arches of the Atlas and Axis. Having severed all the laminae it is only necessary to remove the ligaments attached to them by driving a spinal chisel along the line of incision on each side, when the arches may be lifted up, disclosing the spinal cord below covered with its dura mater.

XXX.

Removal of the Spinal Cord.

To remove the cord take the following steps:

- (1) Carefully pass a thin bladed knife along each side of

it, outside the dura mater, severing the anterior and posterior roots.

- (2.) Divide the cauda equina.
- (3.) Lift up the lower end of the cord and see that it is entirely free up to the foramen magnum. In doing this the greatest care must be taken not to make traction on it. It is best in dividing the cord as stated in (2) above to leave sufficient of the cauda equina to grasp readily in the forceps.
- (4.) Cut through the dura mater at the edge of the foramen magnum to which it is attached.
- (5.) Having already cut the upper end of the cord in removing the brain now carefully draw it out.
- (6.) Place the cord on some smooth surface and with a small pair of scissors open the dura mater in the anterior median line.

SECOND PART.

Chapter VII.

The general Examination of the Organs that have been Removed.

XXXI.

Up to this time we have considered practically only the technique to be employed in conducting an autopsy; that is we have studied the steps that have to be taken in removing the different organs from the body only incidentally referring to a few of the chief points that must be observed and recorded as we proceeded. The remainder of these notes will deal with the detailed examination of the organs and structures that have been removed, or which have been disclosed for examination in opening the various cavities of the body. The chief changes that one is likely to meet with will

be mentioned and their significance explained. By far the greater number of changes met with have already been described in the body of this annual under the several paragraphs devoted to a description of the "pathological anatomy" of the morbid changes found in the different organs, these will therefore be omitted in what follows, reference being made to the preceding pages upon which they have already been described.

It is of prime importance that a physician when performing an autopsy should be able to correctly translate the changes with which he meets. This really is the essential requirement, for of what value would be the most refined technique, if after having properly removed an organ, one was unable to say whether or not it was normal, and if found to be altered, in what the alteration consisted and what it signified?

In the second chapter we noted the chief points to be observed in making an examination of the exterior of the body without going into details, the changes likely to be observed, except in comparatively rare instances, being easily understood. The size of this little manual will not permit of a discussion of those changes that are the least likely to occur, as important as they may be. While therefore the smallest details must be observed and recorded, space will not permit us to enter into an explanation of all that may be found.

In describing in detail the internal organs and structures of the body, we will begin with

XXXII.

The Peritoneum.

After opening the abdomen as directed in paragraph XI, and making the general observations there mentioned, carefully examine the delicate membrane that lines the abdominal cavity and covers its organs, the peritoneum,

it should be everywhere smooth, glistening and pale in color.

Any of the following appearances may be observed and denote the presence of different morbid processes. The chief changes only are given.

XXXIII.

Simple/ Acute Peritonitis.

- (1.) The peritoneum has lost its glistening appearance either in places or everywhere.
- (2.) Instead of being smooth, it is, in places, or generally slightly roughened, granular in appearance, and may even be covered with a definite film of fibrin that can't easily be scraped off.
- (3.) The intestinal coils will sometimes be found glued together by a sero-fibrinous exudate.
- (4.) Close observation reveals the engorgement of the small vessels of the peritoneum which in many cases is so pronounced as to give the membrane a reddish, or even an angry red color.

XXXIV.

Purulent Peritonitis.

This condition presents all the changes above mentioned to which may be added the presence of pus in the abdominal cavity, bathing the peritoneum and usually the intestinal coils. This form of inflammation is always due to some pyogenic microorganism, the ones most commonly found on bacteriological examination being the *Streptococcus pyogenes*, or the *Bacillus coli communis*. In consistency the intestines seem to be more flabby than normal.

XXXV.

Chronic Peritonitis.

- (1.) The peritoneum is found to be thickened in places, or generally is opaque, having lost its normal lustre.

(2) It is of a greyish color.

(3) Not infrequently there is present considerable fluid in the abdominal cavity. All signs of an acute inflammatory process, such as those given in paragraph XXXIII, are absent. There is no engorgement and no exudate of fibrin as above mentioned.

XXXVI.

Tubercular Peritonitis.

In this condition the peritoneum and mesentery are found to be studded with small greyish nodules, varying in size from that of a pea to that of a millet seed. They are larger than the nodules usually found in cases of acute miliary tuberculosis and are less translucent. Where they are as large as small peas they are yellowish in color. These nodules are tubercles.

XXXVII.

Malignant Disease.

Closely simulating the above appearances are the multiple metastatic nodules of certain forms of malignant tumors which, however are rare in comparison with tuberculosis of the peritoneum. It is usually impossible to distinguish between them without the aid of the microscope. The presence of the primary tumor and the absence of tuberculosis in other parts helps one to make the diagnosis.

XXXVIII.

Old Hemorrhages.

These are indicated by the presence of scattered patches of a slate color.

XXXIX.

Old Adhesions.

These may be found binding one or more coils of the intestine together, or to the parietal peritoneum. In either case they indicate the fact that at some previous

time the peritoneum has been inflamed, resulting in the organization of the exudate and the production of bands of fibrous tissue. Sometimes this takes place to a marked degree about the hepatic vein as it leaves the liver to empty into the vena cava, and the gradual contraction of this connective tissue leads to a narrowing of the hepatic vein and the consequent production of a passive congestion of the liver. This condition is sometimes spoken of as proliferative peritonitis.

The Intestines -

XL.

Perforation due to Ulcers, to Appendicitis and to Strangulation.

In cases where an acute peritonitis has been found the entire length of the intestine should be carefully examined as well as the stomach for any possible perforation through which feces may possibly have escaped and set up the peritoneal inflammation. Perforations are usually due to ulceration, the ulcers being chiefly due to typhoid fever and being located in Peyer's patches in the lower portion of the ileum and about the caecum. Tubercular ulcers rarely perforate. (For the explanation of this fact see the chapter on Tubercular ulcers of the intestine in the body of the manual, page 114) Perforation may also be due to gangrene of the gut resulting from strangulation, or to the rupture of an appendicoecal accumulation of pus. These conditions should be carefully looked for.

The intestines should also be examined for the following conditions:

- | | |
|--------------------------|----------------------|
| (1.) Contractions. | (5.) Volvulus |
| (2.) Dilatations. | (6.) Strangulation |
| (3.) Strictures. | (7.) Fecal impaction |
| (4.) Invagination { True | (8.) Tumors. |
| False | |

XLI.

Contractions.

Contraction of the large intestine is quite commonly found, and in some cases follows suddenly extreme dilatation. The condition is unimportant and is probably to be classed as a post-mortem or "agonal" phenomenon.

XLII.

Dilatations.

These are usually found immediately above some obstruction in the gut, are produced mechanically. In some cases especially in children an extreme dilatation of the large intestine is found. An interesting case of this kind has been described by Osler. When the dilatation is great the walls of the intestine may be quite thin and anaemic.

XLIII

Invaginations.

Two forms of invagination are found and must be distinguished from one another. These are the true invaginations which have occurred during life, and invaginations occurring post-mortem, or as "agonal" phenomena. True invaginations always takes place from above downward. The peritoneal surfaces of the entering and returning guts are frequently stuck together by a fibrinous exudate. The mesentery about this portion of the intestine is inflamed and thickened.

Post-mortem invagination on the other hand is free from all signs of inflammation, is readily reduced and may occur either from above downwards, or the reverse. It most frequently is found at the junction of the ileum and caecum.

XLIV

Volvulus or Twist.

This condition is most often found in the large intestine. The parts are discolored and sometimes gangrenous, which is due to the cutting off of the circulation by the closure of the vessels in the knotted portion.

XLV.

Strangulation

This is not common. Occasionally a hernia becomes irreducible and the gut strangulated at one of the rings. Under these circumstances gangrene quickly ensues, unless the trouble is remedied by operation. Rarely the intestine becomes knicked as it were, and the circulation being in this way cut off, the part becomes gangrenous. Very rarely also, contracting bands of adhesions formed by some previous inflammatory process, may cause a strangulation.

XLVI.

Tumors

Tumors of the intestinal walls are chiefly found in the large gut. In the majority of cases they are malignant in character and should be carefully examined after removal. At times the tumor is of considerable size. The walls of the intestines are generally greatly thickened and its lumen correspondingly reduced in size. Above this constriction the gut will be found to be dilated.

XLVII.

Opening of the Intestines

The method of removing the intestines has already been given. It now only remains to open it and carefully examine its mucous membrane. Usually it is advisable to leave this till the last as it is at best

a dirty piece of work. Where there is a sink of considerable size, with running water at hand it may be possible to flush the entire length of the intestinal canal by attaching one end to the faucet and allowing the water to flow through it. In the majority of cases this is impossible and the organ must be washed as it is opened.

For opening the intestine we use what is called an enterotome, a large pair of scissors, one blade of which is longer than the other and rounded, or blunt (Fig. 3 page 4). Introduce the blade with the blunt end into the canal and draw the intestine over it, making the incision along the line of the mesenteric attachment in order not to cut into Peyer's patches which are situated opposite to this border, and which in certain morbid conditions are the seat of important lesions. On account of its size the vermiform appendix must be opened with a smaller pair of scissors.

XLVIII.

Normal Mucous Membrane.

In the normal intestine the mucous membrane is thrown into folds known as the "Valvular Con-niventes"; these are most numerous and of larger size in the upper portion of the small intestine, diminishing in size and number as we approach the ileo-coecal valve, finally vanishing altogether before this part is reached. These folds may be stained with feces and sometimes with bile.

XLIX.

Peyer's Patches.

In the lower portion of the ileum and lymphoid structures known as Peyer's Patches are found. Much smaller lymph glands, the solitary follicles are also

found between the larger patches, which are simply aggregations of the smaller glands. The Peyer's Patches are usually oval in shape, sometimes round, are slightly elevated above the general level of the mucous membrane, are slightly paler in color, and when oval, lie with their long axis in that of the intestine. These structures are quite prominent in children, and in adults, when diseased, while in advanced life they undergo partial atrophy and are in consequence much less easily seen. In young persons also smaller, solitary glandular bodies can be easily seen in the large intestine as slightly elevated, round bodies when diseased may become quite prominent. The following pathological changes are most frequently met with in the intestine:

L.

Oedema.

In cases of advanced nephritis, or in any condition associated with general oedema the mucous membrane as well as the other coats of the intestine are found to be swollen, pale and gelatinous in appearance.

LI

Congestion.

Injection of the small vessels of the mucous membrane is associated with any condition which cause a damming of the blood in the portal circulation. The most frequent causes of this are advanced cardiac valvular lesions, and that form cirrhosis of the liver in which the portal veins are constricted (Atrophic Cirrhosis, see Chapter on Cirrhosis of the Liver, Page 20.) Where the congestion has been severe small hemorrhages may have occurred.

LII.

Inflammation, Acute Enteritis, Acute Colitis, Acute Entero Colitis, Acute Proctitis.

Inflammation of the intestine is not always easily discovered at autopsy. Usually in simple varieties one finds some congestion of the mucous membrane which at the same time is covered with a thick, sticky mucous exudate. In other cases there will be no appearance to point to an inflammatory process. Occurring in the small intestine, an inflammatory condition is known as "acute enteritis". If in the colon as "acute colitis". Occurring in both the small and large intestine it is spoken of as "acute entero-colitis". The lymphatic structures are ~~are~~ usually swollen, and in the colon small irregular ulcers of the mucous membrane may be found. When the inflammation is confined to the rectum it is spoken of as "acute proctitis".

LIII.

For the condition of the intestines in the following diseases see the various chapters on the intestine in the Manual:

- (1.) Typhoid Fever. (Page 111.)
- (2.) Tuberculosis (" 114.)
- (3.) Tropical Dysentery (" 118.)

LIV.

Simple Acute Dysentery

Dysentery of a simple variety is a more severe inflammation of the colon than that described as Acute Colitis. The following changes are found:-

- (1.) The mucous membrane is injected and swollen.
- (2.) It is bathed with serous, or purulent fluid.
- (3.) Hemorrhages into the mucous membrane and into the lumen of the intestine are of frequent occurrence.

- (4) Ulcers of the mucous membrane, and of the solitary lymph glands occur. When these glands are not ulcerated they are ~~not~~ swollen and prominent, and larger than in cases of acute colitis.

LV.

Diphtheritic Colitis.

In very severe forms of inflammation of the colon the exudate that is formed in diphtheritis is of character. (See Lecture Notes for the definition of a diphtheritic inflammation, Page 36.) The surface of the intestinal mucous membrane is covered with a layer of fibrin that extends deeply into the submucous tissue at points where the mucous membrane itself has undergone necrosis. In attempting to remove this fibrinous exudate one tears away a portion of the underlying tissue. This condition is in reality a form of dysentery, the term diphtheritic colitis being preferable to dysentery as it indicates both the location and the character of the inflammatory process.

LVI.

Chronic Dysentery.

The following changes are found in chronic dysentery.

- (1) Thickening of the intestinal walls, the mucous membrane being thrown into folds in a longitudinal direction.
- (2) The intestinal lumen is reduced in size.
- (3) The mucous membrane is absent in places as the result of ulceration.
- (4) Slate colored patches here and there indicate the position of previous hemorrhages into the mucous membrane.

LVII.

Other Intestinal Ulcers.

Aside from the conditions just described which are associated with intestinal ulcers we ^{may} have ulcers under the following conditions:

- (1.) Rarely in cases of Bright's Disease, associated with hemorrhages, and found especially in the caecum and ileum.
- (2.) From the irritation and pressure produced by hard fecal masses.
- (3.) In case of chronic diarrhea small ulcers of the follicle are found.
- (4.) In cases of intestinal obstruction round ulcers may be found above the point of obstruction, the so-called "distention ulcers".
- (5.) In chronic pulmonary tuberculosis small ulcers of the solitary follicles may occur which are not of tubercular origin.
- (6.) In cases of poisoning by bichloride of mercury small, round, or linear ulcerations of the mucous membrane of the caecum and colon are occasionally to be found.

LVIII

Polypus.

Occasionally single or multiple polyps of the intestine may be found. These occur chiefly in the colon. In conditions of general glandular enlargement the lymphoid structures in the intestine become very prominent.

The Stomach.

LIX.

Opening the Stomach.

Opening the stomach with an enterotome along its greater curvature because:-

- (1.) This gives a better view of its walls, and
- (2.) Ulcers when present are most frequently found along the lesser curvature.

Rugae when present show that the stomach was empty and contracted at the time of death, their absence indicating the opposite condition.

The contents of the stomach should be carefully examined for any abnormal constituents and in order to note the extent of digestion. If desired for further chemical and microscopical examination they should be saved. If the case is one upon which the autopsy was done for medico-legal purposes, and poisoning is suspected, the vessel containing the stomach contents should be carefully sealed and labeled. If there is food in the stomach at the time of death it will be found accumulated at the cardiac end and in consequence, the presence of congested vessels of a blackish color, so frequently observed in this portion of the organ, is to be explained by the action of the acid contents of the stomach upon the blood.

LX.

Post-Mortem Digestion of the Mucosa.

Post-mortem digestion of the mucous membrane of the stomach not infrequently occurs and is chiefly found in the cardiac end also. It is distinguished from ulceration by the following:

- (1.) It is extensive and diffuse.
- (2.) The loss of substance is gradual.
- (3.) There is no induration about its edges.
- (4.) There is no signs of acute inflammation and no chronic inflammation of the peritoneal coat.

LXI.

Congestion.

This is denoted by the same signs as already given for congestion in the intestines. It is due to the same causes.

LXII.

Sub-Acute Gastritis.

This condition is denoted by the following appearances:

- (1.) Congestions of the small vessels in the mucosa associated with,
- (2.) The presence of thick tenaceous mucus. (See inflammation of the intestines. Page 34, paragraph. III.)

LXIII.Chronic Gastritis.

In this condition the following changes are found:

- (1.) Atrophy of the mucous membrane.
- (2.) Thickening of the sub-mucous layer.
- (3.) Pigmentation of the mucous membrane especially in the neighborhood of the pylorus.

LXIV.Gastric Ulcer, Acute.

This disease, most frequently observed in women between the ages of 18 and 25 presents the following appearance at autopsy.

- (1.) The ulcer is most frequently located on the posterior wall of the stomach, in the lesser curvature, near the pylorus.
- (2.) There is usually but one ulcer. Rarely the ulcers are multiple.
- (3.) The ulcers have sharply punched-out edges.
- (4.) These borders are not thickened.
- (5.) The mucous membrane is more extensively involved than the sub-mucous coat.
- (6.) There are signs of inflammation of the peritoneum over the seat of ulceration and in some cases adhesion to surrounding parts.

LXV.Gastric Ulcer, Chronic.

Presents the following characteristics

- (1.) The location is the same as in the acute variety.
- (2.) There is usually one ulcer, but more often than in the acute variety one finds several.
- (3.) The edges of the ulcer are indurated and swollen.
- (4.) The base of the ulcer is formed by the sub-mucous or muscular coats, or when gradual perforation has taken place, by some adherent organ as the pancreas, etc., the

escape of stomach contents being prevented by the gradual progress of the ulceration, allowing time for the inflammatory process set up in the peritoneal coat over the base of the ulcer to glue the organ so firmly to other parts that when actual perforation takes place no escape is possible.

- (5) Haemorrhage may have taken place into surrounding parts, leaving slate colored patches.
- (6.) Erosion of some artery may have taken place in the progress of the disease, therefore examine for such a condition.

LXVI.

Pyloric Stricture.

Not infrequently when the stomach has been the seat of ulceration the result will have been a gradual narrowing of the pyloric end, with considerable thickening of its walls. This condition must not be mistaken for malignant growth with which it can easily be confounded as this is so frequently found in the region of the pylorus. The pre-existing ulceration which has given rise to the stricture should be carefully sought for.

Chapter VIII.

Examination of the Lungs, Pleurae & Pericardium.

LXVII.

The Ribs, Sternum and Costal Cartilages.

After having dissected away the skin and muscles from the thorax as already directed, the ribs, sternum and costal cartilages should be examined. Any of the following conditions may be found.

- (1.) Calcification of the cartilages. This occurs normally in advanced life. It is said to occur frequently in the cartilage of the first rib in cases of pulmonary tuberculosis.

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- (2) At the junction of the cartilages with the ribs there may be found sometimes especially on the underside a marked beaded appearance. This is an indication of rickets and is found in children suffering with this disease.
 - (3) Notice any bony growths of the ribs, sternum or clavicles.
 - (4) Notice the shape of the sternum. It may be bulging and prominent or sunken forming the so-called "funnel breast".
 - (5) Examine the underside of the ribs and sternum for possible erosions due to aneurisms of the aorta.
 - (6) Examine for fractures, or result of old fractures of the ribs

The Lungs.

L XVIII

Reasons for failure to Collapse!

Upon opening the thorax, the lungs if perfectly normal, should collapse. It is comparatively rare however that they do so because one condition or another will prevent, the most frequent of which are the following:

- (1.) Pleural adhesions.
- (2.) Emphysema.
- (3.) Collections of mucus in the bronchi which cannot be expelled by the mere force of the elasticity of the lung tissue driving the air out.
- (4.) Consolidation of the lung such as is found in acute pneumonia, extensive broncho pneumonia, or advanced tuberculosis.
- (5.) Extensive fibroid changes in the lung.

The chief external appearances of the lungs have been noted in describing the pleura. It is only necessary here to mention the fact that the apices frequently present scar-like depressions and puckerings due to contraction of bands of interstitial tissue in nearly every case indicating the presence of a chronic, or of a healed tuberculosis at this point.

LXIX.Color.

In children the color of the lungs is pale pink, while in adults there is always found more or less pigmentation, the pigment being deposited in the lymphatics of the under layer of the pleura. (See, "Dust Pigmentation of the lung," page 63-64 of the Manual.) Where death has been accompanied by violent dyspnoea small sub-pleural hemorrhages will be found scattered here and there over the surface of the lung.

LXX.Section of the Lungs:

The best method to pursue in opening the lungs is to first examine the larger bronchial tubes by splitting them up with a pair of scissors. It is advisable to first open the branch which descends near the posterior median border, as in this proceeding but little of the lung tissue is injured. Following up its branches note any presence of mucous, pus, blood, or food particles. Note also the color and condition of the bronchial ^{mucous membrane}, which is occasionally much stained with blood. The appearance is post-mortem and of no moment.

LXXI.Bronchitis.

Injection of the vessels of the bronchial mucous membrane combined with the presence of a considerable amount of thick mucous indicates the fact that there has been a bronchitis in progress at the time of death.

LXXII.Bronchiectasis.

Dilatations of the smaller, or even of the larger bronchial tubes may be found. This condition is known as "bronchiectasis," and occasionally large sacculations filled with a foetid muco-purulent material may be found. In some

cases the shape of these dilatations is globular, while again there may be dilation of a tube for considerable distance leading to the formation of a cylindrical cavity.

The bronchi that pass deeply into the substance of the lung should not be opened unless there is good reason to suspect important changes, as it damages the lung too much for further examination by section.

The branches of the pulmonary artery should be examined for possible thrombosis, or the presence of emboli.

LXXIII.

The Bronchial Glands.

The bronchial glands have been proven to be the starting point for general tuberculosis in so many cases that their examination should never be neglected. In children these glands, which are to be found at the root of the lungs, are especially prominent, as are all the lymphatics, while in adults they are smaller in comparison to the other organs and have changed from a pale pinkish color to being generally deeply pigmented. Several of these glands should be removed for future microscopic examination.

In most cases of pulmonary tuberculosis these glands are found to be involved and many of them are caseous. It is now believed that a certain percentage of cases of pulmonary tuberculosis have their starting point in tuberculosis of these glands.

LXXIV.

A description of the following changes in the lungs will be found in the body of the manual. No mention of them will be made here.

- | | |
|--------------------------------|-------------------------------------|
| (1) Emphysema. | (6) Dust Pigmentation. |
| (2) Atelectasis | (7) Acute Pneumonia. |
| (3) Pulmonary Oedema | (8) Broncho Pneumonia |
| (4) Chronic Passive Congestion | (9) Chronic Interstitial Pneumonia. |
| (5) Hemorrhagic Infarction | (10) Pulmonary Tuberculosis. |

The Pleura.

The following are the chief conditions likely to be met with in examining the pleurae and pleural cavities.

LXXV.

Hydrothorax.

This condition is characterised by an accumulation of fluid within the pleural cavities, which is serous in character, and is due either to passive congestion, the result of serious valvular lesions of the heart, or is found in conjunction with serous effusions in other localities in cases of advanced parenchymatous nephritis. The signs of inflammation are always lacking, and the condition is in the great majority of cases of bilateral.

LXXVI.

Adhesions.

Adhesions between the pleura covering the lungs and the parietal pleura are mainly of two kinds, (1) delicate bands of fibrin, the result of the coagulation of an inflammatory exudate that has been poured out over the pleural surfaces. These fibrinous bands often serve as a ground substance and possibly as food for developing connective tissue which springs up and develops into firm fibrous adhesions binding the lung firmly to the chest walls. This process of developing is sometimes spoken of as "organising", and the adhesions thus formed constitute the second variety found. At first these fibrous bands are very delicate and easily broken, but the older

they become the more they contract and the firmer they get so that in time they distort the surface of the lung very much and are broken with difficulty on attempting to remove the lungs.

LXXVII.

Acute Pleurisy.

By this term is understood an acute inflammation of the pleural membranes which is characterised by the following appearances.

- (1.) The surface of the pleura which is normally smooth and glistening has become dull and opaque.
- (2.) It is seen to be slightly roughened and granular.
- (3.) Not infrequently it is covered with a layer of fibrin which can be easily scraped off.
- (4.) The small blood vessels of the membrane are found to be engorged.
- (5.) If the pleurisy has advanced to the stage of effusion there will be an accumulation of fluid in the pleural cavity of the affected side. In this fluid flakes of fibrin are generally found. Rarely the fluid instead of being serous, or sero-fibrinous in character is purulent and the condition is then known as "empyema" or sometimes is spoken of as "pyo-thorax." More rarely still the fluid found in the chest cavity is bloody, which is either due to tuberculosis, or to some malignant growth.

LXXVIII.

Chronic Pleurisy.

This condition is usually localized and is most frequently found at the apices. It is characterized by

- (1.) The presence of firm fibrous adhesions.
- (2.) Puckering and scarring of the surface of the lung.
- (3.) Thickening of the pleura. This is sometimes very marked.

The Pericardium.

LXXIX.

Normal Appearance.

Like the other serous membranes that we have examined the peritoneum and the pleura, the pericardium normally presents a glistening, smooth surface of a whitish color. When inflamed it presents the same appearances described already in speaking of inflammation of the pleura and peritoneum, that is glistening, smooth surface is converted into a dull opaque one that is decidedly granular and is not infrequently covered with fine filaments of fibrin that have stretched between the parietal pericardium and that covering the heart. On removing the heart these have been broken and portions clinging to the surface of the heart or to the parietal pericardium give it a shaggy look.

As in the case of acute pleurisy, there may or may not be a serous effusion into the pericardial sac.

LXXX.

Hydro-Pericardium.

In cases in which hydro-thorax has been found one is likely to find the same condition involving the pericardial sac, which in these cases is partly filled with a watery fluid. All signs of inflammation are wanting, the condition being part of a general dropsy in most cases. Not infrequently a small amount of such fluid is found in the pericardium in cases that have died of advanced phthisis.

LXXXI.

Blood and Blood Clot in the Pericardium.

Where blood or blood clot is found in the pericardium it is probable that there has been a rupture of an aneurism. If this has taken place suddenly the heart will stop rapidly if there has been an escape of ten

sources while if the blood escaped slowly a much larger quantity can accumulate before death ensues

LXXXII.

Milk Spots.

Whitish spots most frequently seen on the visceral layer of the pericardium, and chiefly over the ventricles, and in hypertrophied hearts, are due to local thickening of the membrane and are known as "milk spots".

LXXXIII.

Chronic Pericarditis.

This condition, like chronic pleurisy, is chiefly characterized by the presence of numerous, rather firm fibrous adhesions that bind the two layers of the pericardium together, and by the absence of all signs of acute inflammation.

Chapter IX.

The Heart.

LXXXIV.

Contents of the heart cavities.

The method for opening and removing the heart has already been given. (Chapter IV, p. 6-18.)

The first observations to be made are upon the character, quantity and distribution of the blood, or blood clots within the organ. The heart may have died in systole that is firmly contracted, in which case its action probably ceased before, or with the cessation of respiration and the cavities of the ventricles are empty in consequence of the firm contraction.

In cases, on the other hand where respiration ceased before the heart, it dies in diastole, that is dilated and the right auricle is always found to be full of blood, while

there is a lesser quantity in the other cavities. Where death was due to suffocation the right side of the heart is found to be distended with blood. Where death is due to paralysis of the heart the left ventricle is overfilled.

LXXXV.

Heart Clots anti- and post-mortem.

It is always of the greatest importance, when one finds clots of blood in the heart cavities, to be able to state whether or not they were formed before or after death, for in the former case they are of importance in explaining the cause of death, while in the latter their presence is of no especial import, blood naturally clotting in the heart cavities and larger vessels when the circulation ceases. For the points of difference between anti- and post-mortem clots see the chapter on Thrombosis in the Lecture Notes.

LXXXVI.

The Valves.

Having thoroughly examined the contents of the heart our attention is next directed to the various valves of which there are four—the Aortic, Pulmonary, Mitral and Tricuspid. We have to determine the following points:—

- (1.) The size of the orifices.
- (2.) The condition of the valve segments.

LXXXVII.

Size.

In order to ascertain the size of the various orifices it is best to employ the graduated ^{cone} which is inserted into each of the openings in succession until it just fits. The diameter of the opening is denoted by the reading on the cone. For the normal size of the various openings consult the table of measurements, etc., in the last chapter.

LXXXVIII.Condition of the valve segments.

The most important observations on the heart refer to the condition of the valvular segments. These in their normal condition are delicate, thin, membranes either arranged as cusps, as in the aortic and pulmonary valves, which by becoming filled with back flowing blood in the aorta, or pulmonary artery, fall together and so close the opening, or as in thin membranes one upon each side of the opening, hanging down into the cavity of the ventricle in such a way that when the blood is forced against them they come into accurate apposition, thus closing the orifice. This class of valve is found closing each auriculo-ventricular opening.

LXXXIX.Valvular Lesions.

Two chief forms of valvular lesions are met with: (1.) Those in which, due to some injury, to the segments themselves, the opening is not fully closed when these segments come together, and (2.) those in which, due either to the contraction or to the enlargement of the opening, the segments do not accurately close the opening. In this latter form of valvular lesion the segments themselves are not at fault, but simply do not fit the opening that they were originally designed to close.

XC.Testing the Competency of the Valves.

In order to determine whether or not such changes in the size of the openings have occurred as will render them incompetent we have to measure them as already described and compare these measurements with the other dimensions of the heart in order to determine approximately whether or not they are relatively in proportion to the rest of the

organ, and if possible to apply some mechanical test to further determine whether or not the opening is or is not actually closed when the segments come together. This is accomplished with comparative ease in the case of the aortic and pulmonary valves where it is only necessary to suspend the heart and pour water into the aorta and pulmonary artery before the organ is opened, when if the closure is complete no water will escape into the heart. In the case of the auriculo-ventricular valves this method is not so accurate, and cannot of course be applied after the heart has been opened. Before the heart is opened we can pour water into the ventricles through the auricles and see whether the valve segments float up as the cavities become filled, into close and accurate apposition. Our greatest reliance however must be placed on the measurements first mentioned. Both of these methods are at best far from giving us any accurate knowledge because of the fact that the auriculo-ventricular valves depends very largely on the muscular contraction of the heart which after death can not be reckoned with.

Lesions of the valves such as just described are mostly found in hearts that have undergone hypertrophy and secondary dilatation, resulting in a widening of the orifices between the orifices and ventricles. Anurismatic dilatations of the aorta or pulmonary artery just above the valves may lead to the same condition of incompetency in these valves. Where the valvular ring is too small it is probably due to cicatricial contraction following an earlier inflammation of the endocardium. This condition can usually be terminated easily by simple examination.

XCI.

Lesions due to alterations in the valve segments.

The second great class of valvular lesions, as already mentioned, are caused by changes in the segments themselves

rendering them unable to close the openings to which they are attached. This condition of affairs is always the result of a previous inflammation of the endocardium, either of the segments themselves, or as in the case of the mitral and tricuspid, of the cordae which hold them. Where such an inflammation has existed the segments are permanently injured and subsequent contraction so distorts them that closure of the orifice is impossible. A segment may in like manner become adherent to the endocardium in its immediate neighborhood and so remain fixed, closure may be rendered impossible by the presence of vegetations or small masses of fibrin attached to the margins of the segments or calcareous deposits in the valves or in the vessels just above them may lead to the same result.

XCII.

Simple Endocarditis.

When the condition of acute endocarditis is met with we find that the membrane lining the cavities of the heart is affected chiefly in the vicinity of one or more of the valves. The condition is characterized by some thickening and by the presence of small "vegetations" chiefly upon the valve segments, and also at times upon the ventricular lining. There is also some capillary injection.

XCIII.

Ulcerative Endocarditis

By far the greatest damage is done to the valve segments by that more severe form of endocardial inflammation, malignant, or ulcerative endocarditis. When this condition is present whole segments may be eaten away, or if not totally destroyed they may be perforated, or partially removed. In either case grave damage is done and the valve rendered incompetent.

XCIV.

The heart muscle.

This may be altered by a variety of morbid conditions. After attacks of fever of some duration, or in conditions of septic intoxication the heart muscle assumes a somewhat lighter color, is opaque and appears to be swollen, the condition being spoken of as "cloudy swelling." In cases of general anaemia the heart muscle shares with the rest of the body the anaemic condition and is decidedly paler than normal. When the anaemia is of long duration, very severe, or when that disease known as pernicious anaemia is present, not only is the myocardium pale, but it assumes a more yellowish tint, is markedly flabby, and is softer than normal. Here fatty degeneration has taken place, a portion of the muscle fiber being converted into fat. (See Lecture Notes on Fatty Degeneration.)

The fatty change may not be present everywhere, but may affect areas of heart muscle here and there, and the presence of these beneath the endocardium gives to the inner aspect of the heart a mottled appearance.

XC.V.

Fatty Infiltration

Quite different from the fatty change just described is that found in cases of general obesity. Here there is an accumulation of fat about the heart beneath the visceral pericardium, in the auriculo-ventricular groove, and about the coronary arteries. Microscopic examination will disclose the presence of fat droplets within the muscle fibers at times, but the fat so present is not the product of the destruction of the cell protoplasm, it is simply deposited within the cell and under favorable conditions will be removed, while the fat present in cases of fatty degeneration, if removed, leaves a permanent

injury to the cell. In the condition of fatty infiltration the muscle has not lost its tone and is not much altered in color.

XCVI.

Brown, or, Pigmentary Atrophy.

We sometimes meet with hearts that are comparatively small, the walls of which are thinner than normal and the muscle darker in color, or even of a peculiar dusky brown hue. This condition is known as brown or pigmentary atrophy and is most frequently associated with such wasting diseases as cancer, etc.

XCVII.

Fibroid Induration.

In individuals past middle life, and especially in those who have thickened arteries and general fibroid changes in various parts we not infrequently find the heart muscle much firmer and not so deep red in color as usual. In many of these cases there has been a previous attack of pericarditis and upon examination bands of fibrous tissue can be seen running into the heart muscle between the bundles of muscle fibres. This may occur quite generally or be only found in a few places. As the process extends these bands of fibrous tissue encroach upon the muscle fibers to such an extent that they become atrophied and their place occupied by connective tissue. This change constitutes the lesion in Fibroid Disease of the heart.

XCVIII.

Hypertrophy.

Large hearts are very frequently met with and are due to a variety of causes that cannot be discussed here for lack of space. It may be stated however that they are found associated chiefly with valvular disease of some standing and disease, pulmonary emphysema and congenital stenosis of the pulmonary artery and aorta.

XCIX.

Varieties of Hypertrophy.

Cardiac hypertrophy may appear in three different forms, the relative frequency of each being as in the order given.

- (1.) Hypertrophy associated with dilatation of the ventricular cavities, or "Eccentric Hypertrophy."
- (2.) Hypertrophy without dilatation, or "Simple Hypertrophy."
- (3.) Hypertrophy associated with a decrease in the size of the ventricular cavities, or "Concentric Hypertrophy."

According to some authorities the last mentioned form of hypertrophy never occurs, the apparent ^{decrease} in the size of the ventricular cavities being due to the contraction produced by rigid rigor mortis.

For the weight and measurements of the normal heart see the Table of weights and measurements in the last chapter.

Of the other changes met with in the heart muscle may be mentioned:-

- (1.) Small abscesses.
- (2.) Tubercles.
- (3.) Ulcerations and small aneurisms.
- (4.) Syphilitic gummata.

C.

The coronary arteries.

The general condition of the coronary arteries should be noted, especially with reference to the presence of degenerative changes of the vessel walls. It is not at all uncommon to find in elderly people extreme atheroma of these vessels which then appear as tortuous, rigid elevations on the surface of the ventricles. The opening of the coronary veins in the right auricle just above the auriculo-ventricular orifice should be examined and its size noted. In like manner examine the openings of the coronary arteries in the aorta just above the segments of the aortic valve.

CI.Embolism of the Coronary Arteries.

Where death has occurred suddenly and without apparent cause the coronary arteries should be carefully examined to as great extent as possible. Open them with a pair of small scissors and be on the lookout for the presence of an embolus. Sudden closure of one of the larger coronary arteries by an embolus results in sudden death.

CII.The aorta.

Not only should the aorta just above the aortic valve be examined, but both the thoracic and abdominal portions should be opened and their condition noted.

One frequently finds, just above the valve a larger, or smaller number of yellowish patches in some of which may be found calcareous particles. These patches are areas of fatty degeneration of the intima of the vessel and in this degenerated tissue lime salts are sooner or later deposited, leading to the formation of plates which are often of considerable size and quite numerous. One of the possible results of this condition is rupture of the aorta and sudden death. The formation of these calcareous plates is not confined to the beginning of the aorta, but may extend throughout its entire course, even involving the greater portion of the arterial system. One should therefore while examining the thoracic and abdominal aorta open the chief arterial trunks which it gives off and examine them also.

CIII.Aneurism.

It occasionally happens that through some weakness of the coats of the aorta it begins to give way gradually to the pressure of the blood within it, and slowly dilates.

Since the weakness is usually confined to a limited area this dilatation is confined to the weak spot and gradually forms a pouch in the wall of the aorta, often of considerable size. This pouch is spoken of as an aneurism, and is most frequently found in the ascending portion of the vessel a little above the valve, and usually outside of the pericardium. It is also found in a large number of cases in the arch of the aorta. When such an aneurism is found it should be carefully opened and the condition of the walls noted. Usually, because of the more sluggish circulation within the expanded portion, and because of the changes in the vessel walls, the blood will be found to have coagulated along the sides, and a careful inspection will show that the clot is arranged in layers. It is by this process of clotting that the aneurism is prevented from rupturing for some time. Sooner or later however the walls give way and death rapidly ensues. Where an aneurism is found the condition of the parts against which it has pressed must be carefully examined. It will usually be seen that where the ribs or the sternum have been pressed upon, the bone will be, to a considerable extent, absorbed. In rare cases this absorption is carried to such an extent that when the aneurism ruptures it breaks externally through the chest wall, death resulting rapidly from hemorrhage.

Chapter X.

*The Liver, Gall-Bladder and Bile Ducts.
The Spleen, The Pancreas.*

The Liver.

CIV.

The Normal Organ.

Under normal conditions the weight of the liver is about

50-60 ounces, or roughly speaking from three to three and a half pounds, in the adult.

For a description of the conditions under which the weight of the liver is increased or diminished, see the section on diseases of the liver in the body of the manual.

In infants the liver is relatively larger than in adults, and the size of the two lobes is more nearly equal. As in the case of the spleen and some other organs, one occasionally meets with small, accessory pieces of liver tissue, or with small extra lobes. These are of no import.

The liver is covered with a close fitting capsule, composed of two layers of tissue, the outer of which is simply a reflection of the peritoneum, while the inner is the true capsule, or the capsule of Blisson as it is sometimes called. This true capsule sends numerous prolongations into the liver substance, along with branches of the hepatic artery and portal vein. These structures together with branches of the bile ducts constitute what are known as the portal canals of the liver.

CV.

Roughening of the Surface.

Normally the capsule is smooth and glistening, but it may become roughened in any of the following conditions. (1.) The various forms of cirrhosis. (2.) Fatty degeneration, and acute yellow atrophy. (3.) Malignant disease. (4.) The late stages of extreme passive congestion, when on account of the shrinking of the organ the capsule becomes wrinkled. (5.) Any conditions that lead to a considerable decrease in the size of the organ. The surface may also become roughened because of previous inflammation of the peritoneal covering. This may occur generally over the surface of the organ, or may be found only in patches here and there. In consequence of such inflammation the organ

may be found to be adherent to surrounding parts, especially to the diaphragm, the hepatic flexure of the colon, to the duodenum, or to the head of the pancreas. Where the capsule of the liver has been thus inflamed and thickened a condition known as "Perihepatitis" is produced.

CVI.

Mottling of the surface

In a large percentage of autopsies the surface, and especially the anterior surface, of the liver is found to be mottled, either by whitish areas, or by patches of a dark reddish purple color. In the first instance the spots are due to anaemia from pressure through the abdominal walls, exerted after death in some way. The darker spots are due to chemical changes produced by the action of sulphurated hydrogen upon the small quantity of iron contained in the liver. These spots are found where the distended stomach or colon has been in contact with this organ.

The under surface of the liver may be of a very deep reddish-purple color, on account of hypostatic congestions.

CVII.

The Gall-Bladder.

The liver should now be turned over and the gall-bladder examined. Usually this is more or less distended with bile. If any adhesions are present they should be noted. With a pair of scissors open the gall-bladder, beginning at the fundus. Allow the bile to escape, and note its quantity, consistency and color. It is usually thick and of a golden brown tint. Concretions may not infrequently be present and should be counted and saved for future chemical examination. Examine the opening of the cystic duct to be sure that no small calculus has worked its way into it.

Where malignant disease of the gall bladder is found, such as primary cancer, etc., the organ is found to be greatly

increased in size, to be firm in consistency and of small calibre. The association of this condition with the presence of gall stones should be sought for and the bile ducts traced as far as possible in order to determine how far the new growth has extended.

CVIII.

For the changes of the liver in the following conditions refer to the section on Diseases of the Liver in the body of the Manual.

- | | |
|---------------------------------|--------------------------------|
| (1.) Cloudy Swelling | (7.) Sympathetic Cirrhosis |
| (2.) Chronic Passive Congestion | (8.) Suppurative " Congenital. |
| (3.) Fatty Infiltration | (9.) " Gummata |
| (4.) " Degeneration | (10.) Tuberculosis |
| (5.) Amyloid Infiltration | (11.) Typhoid Fever |
| (6.) Atrophic Cirrhosis | (12.) Abscess. |

The Spleen.

CIX.

Size Weight, etc.

The normal weight of the spleen is from six to seven ounces. In elderly people however it is considerably less on account of the atrophy that normally takes place as age advances. When found to be smaller than normal its capsule is wrinkled and has lost its usual shiny appearance. Occasionally small bodies composed of splenic tissue are found either attached to some portion of the organ, or independent, in the gastro-splenic omentum. These are known as "accessory spleens."

CX.

Lamellar Fibromata.

While the capsule of the spleen is normally smooth and has the same glistening appearance that characterizes the coverings of all the abdominal and thoracic organs, one

finds at times that it is more or less roughened by firm nodular masses, hard to the feel and almost cartilaginous in consistency. These masses are composed of dense fibrous tissue and are strictly confined to the capsule. To them the name of Lamellar Fibromata has been given.

CXI.

Infarct Bears.

The usual smooth surface of the spleen may also be found to be indented at times with pear-like depressions. Upon section of such an area an abundance of connective tissue is found, the contraction of which has led to the irregularity of the surface. These masses of connective tissue represent the seats of old splenic infarcts. In recent infarcts there are no depressions but areas of deep congestion, the peritoneum over which may be inflamed.

CXII.

Discoloration.

As in the case of the liver the surface of the spleen may be discolored by patches of a deep purple-green hue, which in some instances are so dark as to be nearly black. Careful examination in these cases will show that the spleen has lain in contact with the stomach; and that the sulphurated hydrogen gas so often contained therein has acted upon the iron in the splenic tissue forming in the tissue in contact with the stomach the sulphide of iron which has discolored the surface of the organ.

On section the spleen is normally of a deep red color which turns to a bright red as the oxygen of the air acts upon the haemoglobin of the blood in the exposed surfaces.

CXIII.

A description of the spleen in the following conditions will be found in the section devoted to the Diseases of the Spleen in the body of the Manual.

(1) *Chronic Infiltration*

(2) *Chronic Passive Congestion*

(3) *Tuberculosis*

(4) *Typhoid Fever.*

(5) *Leucocythemia.*

The Pancreas.

CXIV.

The Normal Organ.

The normal weight of the pancreas in the adult is from three to four ounces. In consistency, it is usually only moderately firm, and is very loose in structure. As a rule the pancreatic artery should be opened with a pair of small scissors and its condition noted. The pancreatic duct should be examined in the same way, as occasionally one finds calculi occluding one or more of its branches. To reach the pancreatic duct carefully remove the substance of the organ at about the junction of the head with the body of the same till a white tube is reached. This is the duct and it may now be followed forward and backward and its main branches investigated.

CXV.

Fat Masses.

Malignant Growths.

In the interstitial tissue of this organ, which is abundant and easily observed, little opaque spots are sometimes seen. These are small collections of fat and are of no importance.

Malignant growths when occurring in the pancreas are most frequently located in the end nearest to the liver, that end known as the head of the organ. When such growths are found notice whether the mass presses on the common bile duct, for when there is jaundice it is sometimes explained in this way. Primary malignant growths in the pancreas sometimes give rise to metastatic growths in the liver, and where neoplasms are found in the latter organ the former should be carefully examined for the same condition.

CXVI.Haemorrhagic Pancreatitis.

The pancreas is very rarely found to be greatly softened and to be infiltrated with blood. The condition is one of acute haemorrhagic inflammation and is known as haemorrhagic pancreatitis.

CXVII.Abscesses.

Occasionally small abscesses of the pancreas are found, which in a certain percentage of cases are associated with impaction of the bile ducts with gall stones.

CXVIII.Cirrhosis.

For a description of this condition see the section on the Pancreas in the body of Manual.

Chapter XI.

The Kidneys and Ureters

CXIX.Weight, etc.

In the normal adult the weight of the kidney is about six ounces. The left kidney usually weighs somewhat more than the right. Where there is but one functionally active kidney it becomes increased in size and weight, and may equal the combined weight of the two normal organs.

CXX.Opening the Kidney.

In order to make a careful examination of the kidney it must be opened by an incision along its outer margin carried entirely through it to the pelvis. This portion of the organ in the healthy adult is smooth and shiny

and shows but few injected vessels. Into it the pyramids of the organ dip down and open by minute orifices. From it the urter leads away to empty into the bladder.

CXXI.

Removal of the Capsule.

After having examined the condition of the pelvis the capsule of the kidney should be removed. This is done by catching it between the thumb and finger along the ^{upper edge of the} incision just made. Normally it is stripped away from the organ without any difficulty, disclosing the underlying kidney substance. Occasionally in certain morbid conditions the capsule is adherent to the organ and in attempting to remove it small portions of the kidney substance are torn away with it. This is seen especially in the kidney of interstitial nephritis, where small bands of connective tissue lead from the capsule into the organ and mingle with the overgrowth of this tissue which forms the chief lesion in this disease.

In adults the normal kidney surface is smooth. In children, and not infrequently in adults some remnants of foetal lobulation are visible.

CXXII.

Color of the Kidney.

Normally the cut surface of the kidney is of a dark red color, the medullary substance presenting a striated appearance on account of the long straight tubules. The organ may present on its surface discoloured spots as mentioned in speaking of the spleen and liver, and due to the same cause. A number of conditions alter the color of the organ. It is much lighter in such diseases as anaemia, fatty changes, amyloid infiltration, and chronic interstitial nephritis, while the vessels containing blood stand out more prominently against the lighter back ground. The pyramids, as a usual thing are more deeply congested

than the cortex, and therefore appear sharply defined from it. The kidney is of a darker color in such conditions as acute nephritis and in congestion.

CXXIII.

Inflammation of the Pelvis

When the pelvis of the kidney becomes inflamed it loses its smooth and glistening appearance, becomes roughened and opaque, particles of fibrin may be found attached to its walls and its vessels become injected. In very severe cases ulceration may take place, or its cavity may become partly filled with pus. In these cases pus will be found in the urine.

CXXIV.

Infarcts, Old and Recent

The surface of the kidney which is normally smooth may at times present scar-like depressions, to the bases of which the capsule will be found to be adherent. These depressions are due to previous infarction. Between the depressions the surface of the kidney is often considerably elevated, and where the scars are numerous it may give to the organ a roughly granular appearance, not unlike that found in the condition known as "granular kidney".

While in most other organs infarcts are haemorrhagic in character on account of their open structure, (See Infarction, Lecture Notes) in the kidney they are anaemic, or white, and are seen to be surrounded, when studied in section, by a zone of engorgement, and small cell infiltration.

CXXV.

Pyemic Infarcts

Aside from the simple anaemic infarcts just mentioned, which are due to the usual causes of infarction, (See Lecture Notes), one occasionally meets with what are termed "pyemic infarcts". These are small, and often appear as congested spots with their bases, as in other infarcts, toward the cortex.

of the organ; in which suppuration is beginning about their centres. When this suppurative process has advanced these infarcted areas are converted into multiple abscesses.

CXXVI.

Cysts.

Another condition of the kidney more frequently met with than infarction is cyst formation. In many cases a few small cysts are found on the surface of the organ which is otherwise comparatively normal. When these are examined they are found ~~they are found~~ to contain a clear, yellowish fluid, and to have smooth walls. They are probably due to some occlusion of a uriniferous tubule, the excreted urine being retained, and gradually forming for itself a small cavity, by continuous pressure on surrounding parts, which upon closer examination are found to be atrophied. From this mode of formation these structures have been called "retention cysts."

Not infrequently in cases of chronic interstitial nephritis numerous cysts are formed, at times so converting the organ into a mass of these structures that the condition is spoken of as cystic disease of the kidney. In these cases the contents are not always watery, but may be somewhat thick, on account of the presence of degenerating epithelial elements. Where the watery portion of the contents becomes absorbed as is sometimes the case the contents becomes cheesy in consistency, and one might be led to think that he was examining an area of tissue necrosis which had undergone cheesy degeneration. The formation of these cysts in cystic disease is practically the same as that of the retention cysts, already mentioned, bands of connective tissue by contracting and thereby closing up the tubules, prevent the further onflow of the urine which in consequence accumulates above the constriction.

CXXVII.Hydro-Nephrosis.

In the condition known as hydro-nephrosis cyst like cavities are found which upon close examination are seen to be but dilated portions of the calyces of the pelvis and open into it.

CXXVIII.The Cortex.

In estimating the thickness of the cortical substance of the kidney it must be remembered that under normal conditions it may vary somewhat within narrow limits, and that if the section be made obliquely it will appear to be broader than it really is.

The cortex is found to be thickened in the following conditions. (1) Fevers, especially of the septic variety. (2) Acute parenchymatous nephritis, and (3) Chronic parenchymatous nephritis.

In the following conditions it is narrower than normal; - (1) Hydro-nephrosis. (2) Chronic interstitial nephritis. In using the term chronic interstitial nephritis we here include the contracted white kidney, and the small red kidney of arterio sclerosis.

CXXIX.Other Morbid conditions of the Kidney.

For the gross appearances in the following morbid conditions consult the section on diseases of the kidneys in the body of the manual.

(1.) Chronic Passive Congestion	page 92
(2.) Acute Parenchymatous nephritis	" 95
(3.) Chronic " "	" 96 to 98
(4.) " Interstitial "	" 99 " 102
(5.) Amyloid disease of the kidney	" 103 " 105
(6.) Tuberculosis of the kidney	" 108 " 109

The Ureters.

CXXX.

The ureters should be dissected away from surrounding structures and traced from the pelvis of their respective kidneys to the bladder which they enter in an oblique manner, one on each side. These tubes lie, one on each side, close to ^{the} psoas muscle, and can be found without difficulty. Any of the following conditions may be present and should be looked for.

- | | |
|------------------------------------|------------------------|
| (1.) Twists | (4.) Inflammations. |
| (2.) Dilatation, general or local | (5.) New growths. |
| (3.) Strictures | (6.) Impacted calculi. |
| (7.) Ulcerations. | |
| (8.) Thickening of the walls, etc. | |

Chapter XII.

The Pelvic Organs.

The Male and Female Organs of Generation.

CXXXI.

The Bladder.

This organ the method for the removal of which has already been given, should be examined for any of the following conditions, which are so easily made out that a detailed description of them is not necessary.

CXXXII.

New growths.

These may be found either growing from the outer side of the bladder wall, from the inner side of the wall, in either case forming a distinct mass, or infiltrating the walls generally, in which case no distinct tumor will be found, but the wall in the locality of the neoplasm will be greatly thickened. The margins of

the new growth will not be sharply defined, but it will shade off into the healthy tissue on all sides. New growths of the bladder are, in the majority of cases malignant in character, and carcinomatous in structure.

CXXXIII.

Dilatation.

This condition is most frequently found in men in advanced life and is secondary to some trouble in the prostate gland, most frequently hypertrophy, or to some trouble in the urethra, generally stricture following attacks of gonorrhea in early life. Both of these primary conditions lead to a very gradual decrease in the size of the urethra and to the consequent very gradual damming back of urine in the bladder, the walls of which slowly lose their tone till finally there is considerable dilatation and the retention, constantly, of a certain amount of urine which is not expelled during the act of micturition.

CXXXIV.

Contraction.

This is much less common than dilatation and is usually due to thickening of the bladder walls from one cause or another. Where there is a neoplastic infiltration of the walls, for example, the cavity of the organ will be much reduced in size, and though there is no actual contraction of the muscles, the cavity is contracted in size, and this is what is most frequently meant when contraction of the bladder is spoken of.

CXXXV.

Hypertrophy of the Walls.

When this condition is present the muscle fibers show up quite distinctly as columns beneath the mucous

membrane, which is not infrequently so thrown into folds that small pouches are formed, in which calculi may become encysted. When hypertrophy is found carefully investigate the openings of the ureters, which may be very much obscured. Pass a probe from the cut ends of these tubes into the bladder, for occasionally small calculi will be found in that portion of the tube which passes through the muscular walls. When the bladder is found empty and contracted, the mucous membrane will be thrown into folds, and the underlying muscle fibers so distinct at times that the condition may be mistaken for hypertrophy.

CXXXVI.

Inflammation of the Mucous Membrane.

In acute inflammation of the bladder, that is in acute cystitis, we find the mucous membrane deeply injected and covered with a fibrinous exudate. In very severe cases ulcerations are found here and there.

Where the inflammation is chronic in character the mucous membrane is thickened and thrown into folds. It is of a dirty greyish-purple color, is more or less covered with thick, tenacious mucous and at times contains a deposit of phosphates. Slate colored patches which are sometimes found, indicate areas previously inflamed.

CXXXVII.

Tubercular Cystitis.

Tubercular disease of the bladder is characterized by the presence of ulcers of varying size, which are due to the breaking down of the tubercles that have formed in the mucous membrane. As the disease advances these ulcers increase in size, their bases are rough and their edges irregular. A microscopic examination discloses numerous tubercles in all

stages, in the walls of the ulcers and in the surrounding tissue.

CXXXVII.

The Urine, etc.

In examining the bladder always note the character of the urine that it contains. It is often turbid, but unless ammoniacal its turbidity is of no importance. It should be carefully examined for any trace of blood, pus, mucous or deposits of gravel. Urine that has stood in the bladder for some time after death does not of necessity contain albumen.

CXXXIX.

The Prostate Gland.

Before concluding the examination of the bladder examine the prostate gland to see whether it is enlarged, and if so in what way, and whether it presses upon the urethra in such a way as to partly occlude it. Notice also whether any part of the base of the bladder is below the level of the urethra.

CXL.

The Urethra

To examine the male urethra open the penis along its dorsal aspect with a pair of scissors. The mucous membrane should be examined for ulceration, cicatrization and for any signs of inflammation. The location of any stricture should be noted, and false passages looked for. Measure the circumference of the urethra above and below the stricture, and take also the length and circumference of the stricture itself.

CXLI.

The Testes.

Leaving out of consideration the examination of the epididymis, cord, seminal vesicles and vas deferens,

which need only be examined in special cases and a consideration of which will be omitted from this manual for lack of space, the testis should be sectioned as was the kidney and its condition noted. In health its tissue is white, or creamy in color, bulges out after the section is made and has a fluffy appearance.

CXLII

Syphilitic Orchitis.

The most common morbid conditions found are due to syphilis. When this disease affects the testis we may have either a general development of connective tissue, rendering the organ firm and hard, or gummatous may be formed. These latter structures appear as round areas of cheesy material, sharply defined from the healthy tissue, and are surrounded by a more or less perfectly developed zone of connective tissue.

CXLIII

Tubercular orchitis.

In cases where the testicle is affected with tuberculosis, cheesy masses may also be found not only in the testicle, but also in epididymis, seminal vesicles and cord. These resemble very closely the gummatous masses just spoken of, but are usually not so large, and when present in the testicle the epididymis and cord will show numerous small tubercles, which are easily recognized. It may however have a microscopic examination to determine the nature of the cheesy masses found in the substance of the testis.

CXLIV

New Growths.

Tumors of the testis are most usually malignant in character. Sarcomata are most frequently met with. When starting in the testis they spread up the cord

and involve the lumbar glands. A non-malignant tumor composed of cartilage (enchondroma) is also at times met with in this organ.

CXLV.

The Female Organs of Generation.

This group of organs, omitting those that are external, consists of the vagina, uterus, tubes and ovaries.

CXLVI.

The Vagina.

It is not necessary to measure this organ. The following points are to be observed:—

- (1) Are there any lacerations
- (2) Are there any ulcerations of the mucous membrane.
- (3) Is there any discharge and if so what is its character, and is it from the vagina or from the uterine os.
- (4) If deemed necessary the vaginal discharge should be examined for gonococci, or spermatazoa.

CXLVII.

The Uterus.

The uterine cervix extends into the upper portion of the vagina. The condition of this cervical portion and of its os varies according to whether the woman has, or has not borne children. In the latter case the os is round and shows no signs of laceration, its edges are smooth. In those who have borne children the os is irregular in shape, is usually slightly scarred, where portions have given away during labor, or may show either considerable laceration, or the scars from the same.

CXLVIII.Granular Erosions.

Where there is considerable catarrh of the cervix the mucous membrane may be roughened and granular in appearance. This condition is spoken of as erosion of the cervix.

CXLIX.Malignant Growths.

When malignant growths of the uterus occur they most frequently start in the cervix, and may be found upon examination as uneven masses, not infrequently showing some ulceration of their surfaces, and sometimes presenting a cauliflower appearance. Mucous polypi may exist in the cervical and extend into the vagina through the external os.

CL.Opening the Uterus.

In order to open the uterus for further examination incise the organ along its anterior aspect from the fundus to the external os. Extend the incision from its upper end into the Fallopian tubes on either side.

CLI.Examination of the uterus.

Normally the uterus is small (2½ in. in length) firm and contains a small triangular cavity lined with smooth walls. In advanced life it undergoes atrophy. During menstruation it, as well as the vagina, contains a little dark blood, and the uterine mucosa is shreddy. The following conditions should be looked for, and if found, noted:

CLII.(1) Pregnancy.

CLIII.(2) Endometritis.

Here the mucous membrane is usually roughened, thickened, nodular, and may be covered with a layer of pus. In other cases it may be the seat of numerous small polypi.

CLIV.(3) Fibroid Tumors.

These may be found either upon its outer aspect beneath the serous coat (sub-serous), within the muscular wall of the organ, (intra-mural), or beneath the mucous membrane (sub-mucous). The sub-serous and sub-mucous tumors may be either sessile or pedunculated. Malignant tumors rarely start from the body of the organ, but from the cervical portion in the vagina.

CLV.(4) The changes produced by septic (puerperal) fever.

In cases of puerperal fever the uterus is always larger than normal as involution has not had time to take place. Its walls are thickened and swollen and its cavity contains a mass of necrotic material, the remains of placental tissue and of the sloughing diseased uterine mucosa. There is not infrequently a general peritonitis and the pelvic cavity may contain considerable pus. The condition of the uterine mucous membrane, which in some cases is not as necrotic as just described, but is smoother and covered with a bloody discharge, is due to the action of different forms of micro-organisms, chiefly the streptococcus and less frequently the *Bacillus Coli Communis*. Cultures should be made from the necrotic material.

CLVI.The Fallopian Tubes.

Examine the fimbriated extremities of the Fallopian tubes

and determine whether they are patent, or have been closed by some previous inflammatory process. Note also whether the tube is free along its entire length, or is adherent to surrounding parts. See whether any changes in the calibre of the tube have occurred, and look especially for localized enlargements which may contain either a watery fluid, (Hydrosalpinx), pus, (Pyosalpinx), or blood (Hæmatosalpinx). Where these conditions are present there are signs of old, or recent inflammation in the surrounding parts. Tumors of the Fallopian tubes are rare.

CLVII.

Hæmatomata.

Between the folds of the broad ligaments occasionally one finds a large collection of blood, firmly clotted and forming a tumor mass frequently of considerable size. The collection of blood may occur as a single mass, or there may be a number of similar collections, it may be confined to one side or occur on both. These collections of blood between the folds of the broad ligaments are known as hæmatomata. At times they are encapsulated.

CLVIII.

The Ovary.

In the normal adult female the ovary is a flattened, almond shaped organ, lying, one on each side, near the end of the Fallopian tube in the broad ligament. After maturity the surface of these organs is scarred, each scar representing the healed corpus luteum from which at some previous menstrual period an ovule has been discharged. Before the age of ovulation the surface of the ovary is smooth. In advanced age the organ atrophies and becomes very firm and hard.

In examining the ovary its position should be first determined, as it is not infrequently found to be prolapsed and lying in Douglas pouch.

Enlargements of the ovary are chiefly due either to new growths, many of which are malignant in character, to inflammatory processes, to tuberculosis and to the formation of cysts. The presence of any of these conditions should be noted.

CLIX.

Section of the ovary.

Upon section the ovary is seen to be bounded by a narrow layer of dense connective tissue, the "Tunica Albuginea". The central portion of the organ is composed of a looser stroma containing many blood vessels and beneath the outer tunic can be seen numbers of Graafian follicles in all stages of development, the largest being nearest the surface and often containing a clear fluid. Corpora Lutea, the bodies that remain after the Graafian follicles have discharged their contents can also be seen as small areas of a dark brownish color. The corpus luteum of pregnancy is always much larger than that of menstruation. The oldest corpora lutea are merely small collections of pigment.

CLX.

Inflammation of the Ovary.

In inflammation of the ovary the organ is found to be increased in size, is of a reddish color and is softer in consistency than normal. In size it may become as large as a pigeon's egg or even larger and upon section may contain small collections of pus.

CLXI.

Cysts.

One must be careful in examining the ovary not to mistake the large Graafian follicles, and the cysts formed from old corpora lutea for true ovarian cystic degeneration. Cystic disease of this organ is not ^{at} all uncommon and in chronic

inflammation (chronic ovaritis) cystic degeneration often occurs, numerous small, fluid containing cavities being found scattered throughout the organ.

Space will not permit us to give here a description of the various forms of cysts and of cystic tumors that are found in the ovary, and the student is therefore referred to larger works on the subject.

CLXII.

The Female Breasts

In making the external examination of the female breasts the following points must be observed:—

- (1) Size. Remember that this varies both with age and during gestation and lactation. Hypertrophy occurring at other times is due either to glandular increase or to an increase in the amount of adipose tissue.
- (2) Consistency
- (3) Color of areolae
- (4) Condition of the nipples.
- (5) Presence of nodular masses.

The breast is now to be sectioned, and this should always be done from the upper side, being careful not to injure the skin. The following conditions should be sought for.

CLXIII.

Acute Mastitis.

Acute inflammation of the breasts is characterized by the following appearances. The tissue is congested, swollen, more or less infiltrated and there are not infrequently abscesses formed. The situation of these abscesses varies in different cases. They may be found either in the substance of the gland, behind the gland, that is between it and the pectoral muscle, or just beneath the skin.

CLXIVChronic Mastitis

Chronic mastitis is characterized by an overgrowth of connective tissue in the gland. The condition may be either general or local and is not infrequently accompanied ~~by cysts~~ by the formation of cysts. Occasionally firm, fibrous nodules are met with. The cysts above mentioned, which may also be found at times in the atrophied breasts of old age, may contain either altered milk, serous fluid or more rarely blood.

CLXVTumors

Tumor masses are frequently found in the female breasts and either benign or malignant. Aside from the fibrous nodules just mentioned as occurring in chronic mastitis, adeno-fibromata, sarcomata, adeno-sarcomata and carcinomata are met with.

Whenever a tumor is found in the breast, no matter what its location, or its apparent character, a careful examination of the axillary glands should be made to discover whether or not extension to these structures has taken place.

In describing a tumor of the breast note (1) whether or not it is encapsulated. (2) What its consistency is. (3) Whether it is attached to the skin or is freely movable. (4) Whether or not the nipple has become retracted, and (5) Examine also the underlying pectoral muscle for possible metastatic growths.

CLXVIColor of the Breasts

Normally where the gland is in a resting state the color of the cut section is whitish on account of the preponderance of fibrous tissue. Close observation shows, here and there, small pinkish spots, the sections of glandular acini.

During gestation and lactation the color of the section is more pinkish and looks granular. On pressure at this

leave a small amount of colostrum or of milk can be squeezed out, which, when examined carefully, may be watched for pus.

Chapter XIII.

The Skull, Dura and Cerebral Sinuses

CLXVII.

The Skull Cap.

The examination of the skull resolves itself into an examination of the skull cap that has already been removed, and an examination of the skull.

The chief things to be looked for after carefully removing the dura are, (1) Fractures. (2) Peculiarities of development. (3) Rickets changes in the bone, and (4) Tumors. In children the ^{superficial} fontanelles should be noted. The anterior fontanelle should be closed by the end of the twelfth month the others keeping open for a somewhat longer time. Should these openings continue patent for a longer time than is normal it usually indicates either rickets, or hydrocephalus.

CLXVIII.

Changes in the Bone, Thinning and Softening.

Thinning of the bones of the skull is sometimes found and may have advanced to such an extent that only a delicate bony structure is met with instead of the usual firm thick bone. This absorption of bone is more frequent due to congenital syphilis and to rickets. In the adult, heavy labor of the scalp will in some cases lead to an absorption of the bones of the skull on account of the constant pressure that they exert. Hydrocephalus also produces thinning of the bones of the skull because of expansion.

Softening of the bones of the skull sometimes occurs as a

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result of syphilis. In these cases the bone may be readily cut with a knife.

CLXIX

The Periosteum. Chronic Periostitis

The condition of the periosteum of the cranial bones must also be carefully examined. General thickening of these structures is the result of chronic periostitis, and is not infrequently syphilitic in origin, either congenital, or acquired. The changes produced may be tabulated as follows:-

(A.) Congenital Syphilis

- (1.) Atrophic changes. (Craniotabes), with marked thinning of the bones, or
- (2.) Softening without thinning of the bones, or
- (3.) Changes leading to the formation of symmetrical nodes (periostitis) over both parietal and frontal bones, around the anterior fontanelle

(B.) Acquired Syphilis.

- (1.) Local thickening due to periostitis. (nodes)
- (2.) General sclerosis of the clavaria due to ostitis.
- (3.) Carious and ulcerative changes. The bones become wasted and pitted, and at the same time new bone is formed by the periosteum, giving the surface a peculiar appearance. Simultaneously, there is necrosis and areas of dead bone may be seen

CLXX.

The Base of the Skull.

Fractures should be first looked for. Necrosis and inflammatory lesions especially about the petrous portion of the temporal bone may occur. In these cases the dura is dull and lustreless.

CLXXI.

The Cerebral Sinuses.

- (1.) Open the cavernous sinus and note whether or not there is thrombosis.

- (2) Trace the petrosal sinusses backward, the larger one, the inferior, to the jugular fossa, and the smaller one, to the lateral sinus.
- (3) Open the lateral sinus and examine it for thrombosis, bearing in mind the difference between the clots that are formed before and after death. When clots are found that have existed before death they are due either to meningitis, to an inflammatory process of the internal, or middle ear, or to injury to the bone.
- (4) Where thrombi are found the jugular veins, cerebral veins and the superior petrosal sinus should be carefully examined for similar changes.
- (5) Where thrombi are found one should also look for such later changes as softening, and the condition of the walls of the vessels should be noted.

CLXXII.

The Pituitary Body.

The Pituitary body left in the Sella Turcica, should be examined, especially if Acromegally, or pathological changes in the thyroid have existed, as it is now supposed that in these conditions this structure is altered.

CLXXIII.

The Dura Mater.

Examine the dura mater for the following points:

- (1) Adherent dura. This frequently due to old inflammations occurring as a result of syphilis, or alcoholism. Other evidences of these conditions should be looked for in other portions of the body.
- (2) Blood effusion. When this condition is found between the dura and the skull it is an indication of death from violence and the bones of the skull should be very carefully examined for fracture, and the scalp for evidence of a wound of any kind.

- (3) Purulent effusions. The presence of pus between the dura and the skull is of rare occurrence and in the majority of cases is due to some disease of the bone which should be looked for.
- (4) Thickening of the dura. This is rarely found and is due to the development of a membranous tissue, (Pachymeningitis, due to syphilis, alcoholism, and found in the paralyzed insane.
- (5) Pachionian Bodies. On either side of the longitudinal fissure there are not infrequently found numerous minute rounded white bodies that resemble tubercles, but must not be mistaken for them. These are known as Pachionian bodies.

CLXXIV.

Before completing the examination of the membranes of the brain, carefully inspect the Arachnoid membrane and the pia mater for evidences of meningitis.

The veins running over the surface of the brain are frequently noted as being full of blood. This is not pathological and does not indicate an ante-mortem passive congestion.

Chapter XIII. (a) Examination of the Brain.

CLXXV.

The surface of the Brain.

The surface of the brain should be examined for the following conditions; (1.) Atrophy of the cortex. (2.) Asymmetry. (3.) Local prominences. (4.) Depressions (5.) Blood clots outside of the arachnoid. (6.) Areas of softening (7.) Injuries, bruises, etc., which are most marked opposite to the external injury.

Local prominences when found may be due to the presence of tumors, or of abscesses, while depressed areas are usually the result of pressure exerted from without and the skull should therefore be carefully examined for tumors, or areas of depressed bone.

When areas of softening are found in the cortex the pia mater will often be found to be adherent over the same. In attempting to remove the membrane one finds that it is peeled off with much more difficulty than that over the uninjured parts.

Atrophy, softening, abscess formation and the presence of a tumor must be carefully looked for in those cases that have presented symptoms indicating the involvement of cortical areas.

In cases in which bruises of the surface of the brain are found, the skull must be examined for injury. Opposite to the point of injury to the surface of the brain, one will usually find either fracture, or severe injury to the skull, and beneath this point of injury the brain may also have sustained some damage.

CLXXVI.

Meningitis.

In every examination of the brain the operator should look carefully for the signs of meningitis. Generally the surface of the organ will be found to be bathed with a purulent, or sero-purulent fluid, which being external to the pia mater can be readily washed off. The process may be either general or local. Such a condition as this is usually secondary to inflammation of other parts, such as the nose, ears, etc., or it may be the result of direct injury or of tumor or abscess formation. In looking for the cause of this inflammation of the meninges one should carefully examine the organs just mentioned if there is no sign of fracture or other condition that could have produced it.

CLXXVII.Primary Meningitis, Epidemic Cerebro-Spinal Meningitis.

A second variety of meningitis differing somewhat from that just described may be found. In this variety the inflammatory exudate, of pus, or sero-purulent fluid is generally more intimately associated with the pia mater, and in consequence is not so easily washed away. The inflammation in these cases is primary and not due to extension from other inflamed parts. As in every case of meningitis, the arachnoid membrane becomes opaque and dull. In severe cases there will be found softening of the cerebral cortex and hemorrhages may be met with here and there in the brain substance.

CLXXVIII.Tubercular Meningitis.

A third variety of meningitis is that due to the tubercle bacillus. In this variety the signs of inflammation, such as were met with in the other varieties are wanting. There is no exudate of pus, or of sero-purulent fluid, but the pia mater is found to be studded with milium tubercles. These as a usual thing are most numerous along the course of the vessels at the base of the brain, near the optic Chiasm, and over the lower portions of the cerebral surface generally.

CLXXIX.Chronic Meningitis.

A chronic inflammation of the meninges is occasionally met with, especially in old alcoholics, and in syphilitic patients. In the former the condition is apt to be general, while in the latter it is most frequently local. Chronic meningitis may occur in children and is found chiefly at the base of the brain. In all cases of this condition the pia mater is found to be opaque and thickened.

CLXXX.The Cerebral Vessels. Atheroma, etc.

The vessels of the brain should always be examined carefully for signs of atheroma and for calcareous changes. Where atheroma is found the vessels are rigid, do not collapse when cut across, and can be felt to be distinctly thickened.

When carefully examined it is seen that the intima is considerably thickened, and in places separates easily from the other coats of the vessels. So great may this thickening be that the lumen of the vessel may be nearly entirely occluded. This condition of atheroma is most frequently, though not always, a result of syphilis. Aside from examining the vessels for this condition, one should look also for thrombi, emboli or aneurismal dilations.

CLXXXI.Sections and examination of the brain.

So far we have only examined the surface conditions that may be found. In order to continue our examination we must before proceeding further, section the organ. Unless the brain is sectioned in an orderly and intelligent manner it is useless to continue the examination, as the normal relations of the parts, which are complicated in the extreme, are so altered that one is unable to localize any morbid conditions that may be found. Two methods for examining the brain are chiefly used, both having their especial advantages, the one to be used under certain conditions, the other to be used when different conditions present themselves.

One of these methods was introduced by the German pathologist Virchow and is known as Virchow's method, the other being first advocated by Belser, and afterward modified by Hamilton. In following Virchow's method the organ is so much cut up that in case we are anxious to trace out diseased tracts it is nearly impossible to do so, while by the

method of Piter this can be done perfectly, though the brain as a whole can not be quite so readily examined as by the former method. Both will be given as concisely as possible.

CL XXXII.

Virchow's Method of sectioning the Brain

This method must only be used where one does not intend to harden the brain for the future study of diseased tracts.

- (1) With the brain lying base downward, separate the two hemispheres disclosing the corpus callosum and with the left hand slightly raise the left hemisphere which is usually the first to be examined. With a sharp knife make a shallow incision along the junction of the corpus callosum with the median surface of the hemisphere. This incision opens the roof of the lateral ventricle.
- (2) In order to further lay the ventricle open continue the incision forward the whole length of the corpus callosum and outward into the frontal lobe, opening in this way the anterior horn of the lateral ventricle, while the posterior horn can be opened by continuing the incision out into the tissues of the occipital lobe. Care must be taken not to injure any of the structures that form the floor or walls of the ventricle.
- (3) Lay the left hemisphere a little to one side, and with a long brain knife cut vertically downward through the floor of the ventricle, continuing the incision till the knife reaches almost to the cortex of the under portion. Be careful not to injure the basal ganglia. The hemisphere can now be turned far outward on the left side. Open the right ventricle in the same way.

Both lateral ventricles can now be thoroughly studied, their size and contents noted and the choroid plexus investigated. The middle horn of the ventricle can be opened if desired.

- (4) Pass the knife through the foramen of Monro and divide

- the corpus callosum and the fornix by cutting forward and upward. Turn the parts lying posterior to this incision backward, exposing in this way the vellum interpositum, which with its choroid plexus can be easily examined.
- (5.) Raise this structure and cut the large veins that enter it from the basal ganglia. The vellum may then be removed from the pineal body and the corpora quadrigemina.
 - (6.) This proceeding exposes the third ventricle which with the structures that form its walls can be inspected.
 - (7.) Next divide the posterior pillar of the fornix and turn the corpus callosum, fornix and vellum interpositum over to the left.
 - (8.) Place the left hand under the pons and cerebellum and slightly elevate the vermes. Make a careful incision exactly in the median line through the centre of the vermes. The hemispheres of the cerebellum fall apart and disclose the cavity of the fourth ventricle. Prolong the incision in both directions opening the whole ventricle and the aqueduct of Sylvius. This completes the opening of all the cavities of the brain, and their contents and condition should be carefully noted.
 - (9.) To further inspect the cerebral hemispheres, support each in turn in the left hand and with a clean long brain knife divide and subdivide each from before backward, until in the opinion of the operator it has been sufficiently dissected. Carry each incision almost through to the cortex of the under surface.
 - (10.) In order next to study the basal ganglia it is directed to place the fingers of the left hand under the central portion of the brain and make a number of transverse incisions about 5mm. apart, beginning at the anterior edges of the corpora striata and passing backward through all the basal ganglia. Each incision is to be carried to a corres-

ponding depth, ending just within the cortex of the under portion. In this way the various structures are held together in their normal position, and still nearly every portion can be examined, and the various cut surfaces compared. The parts can also be folded so as to again restore the brain to its normal shape.

(11.) In order to examine the hemispheres of the cerebellum which have already been separated by the incisions that opened the fourth ventricle, it is only necessary to divide each hemisphere by a cut which runs from the 4th ventricle along the middle branch of the Arbor Vitae, extending the same almost to the cortex of its convex surface. The resulting halves can be further subdivided if desired.

(12.) Place the pons, medulla and what portion of the cord is attached to the brain, over the index finger of the left hand and divide the various structures by parallel, transverse incisions in the same way that the basal ganglia were divided. The two peduncles of the cerebrum can also be sectioned in the same way.

CLXXXIII.

Petres Method. The Method of transverse Section.

(1.) Remove the medulla, pons and cerebellum by cutting through the cerebral crura at about their middle point. The portions so removed can be sectioned and examined in the way already given, and the fourth ventricle can be opened by section through the vermes.

(2.) Place the brain upon the table vertex downward keeping it in one position while the following transverse incisions are made:

Section I. Through the anterior half of the 3rd frontal convolution

" II. Through the tip of the temporo-sphenoidal lobe and the operculum.

" III. Through the brain immediately in front of the optic chiasm

Section IV. Through the infundibulum.

" V. Through the corpus Albicans.

" VI. Through the anterior margin of the pons.

" VII. Passes across the front of the angular gyrus.

By the use of this method one is enabled to trace the progress of degenerated tracts from one portion of the brain to another or to trace into the brain degenerated tracts from the cord or medulla. In both the methods given one can very accurately locate the position of lesions and describe the same with exactitude.

CLXXXIV

The Cord.

Section of the cord is made in the same manner as section of the pons and medulla, the incisions being made a few millimeters apart, perpendicular to the long axis of the cord and not carried quite through its entire thickness.

Chapter XIV.

How to treat wounds received while dissecting, or in the course of a post-mortem examination.

CLXXXV

Wounds received while dissecting, or while performing an autopsy often lead to serious results unless treated promptly and in the proper way. Such wounds are almost of necessity infected with septic micro-organisms of various kinds which give rise to blood poisoning. No matter how small the wound received it should be immediately disinfected for the smallest pricks with an autopsy needle are likely to lead to as serious results as larger cuts; in fact they often prove to be more serious because free bleeding is not produced.

The following simple directions should be followed:

When the wound is a small one, a small cut or puncture it may be cauterized with nitrate of silver stick, or with pure carboloid acid. When it is larger it should be treated in the following manner:

- (1) Check the venous and lymphatic circulation as soon as possible by applying compression.
- (2) Clean the surrounding skin with some antiseptic fluid such as bichloride solution, 1 - 1,000, or carbolic acid solution 10%.
- (3) If necessary to further cleanse the wound thoroughly, scrape it with a clean sharp knife and allow for bleeding.
- (4) Wash and dress with antiseptic dressing.
- (5) Allow an assistant to finish the autopsy.

Before beginning to dissect, or before every autopsy carefully examine the hands for abrasions, or small wounds. Especially be careful to examine the base and under edges of the finger nails, where not infrequently small wounds exist that are likely to escape notice. Some operators advise the use of rubber gloves, or finger tips. It is my experience that there do more harm than good because when they become moist with the blood they are very slippery and the danger of becoming wounded by the hand slipping against the knife is greatly increased.

In cases where it is imperative that the operator continue the autopsy after receiving a slight wound, he should after treating it as first described apply some impervious dressing, or put on a rubber finger tip and proceed very cautiously. One should never close an infected wound with collodion, and even after thorough cleansing such an application should be avoided for fear of enclosing septic material. Further than this, collodion applied to the skin soon begins to peel off and therefore offers very little protection.

The following figures are taken, with few exceptions from "Daten und Tabellen" by Verordt, published in Jena in 1893.

Brain...	{ Male 1358 grams				15-17-14 x 12.5 cm.
	{ Female 1235 "				
Heart....	{ Male 300 "	Length, 8.9 cm		Width 8.5-10 cm.	
	{ Female 250 "				
"	Circumference at base of the ventricles		25.8	cm	
"	Thickness of left ventricle wall		1-1.4	"	
"	" " right " "		0.3-0.5	"	
"	Depth of left ventricle		9.5	"	
"	" " right " "		10.0	"	
"	Circumference of mitral valve		10.4-10.9	"	
"	" " tricuspid "		12.0-12.7	"	
"	" " aortic "		7.7-8.0	"	
"	" " pulmonary "		8.9-9.2	"	
Kidneys...	Weight combined, 299 grams.				
	Measure, (11-12) x (5-6) x (3-4.5) cm.				
	Cortex in thickness, 0.4-0.6 "				
	Relation of cortex to medulla, 1 to 3.				
Lungs,	Right, 513 grams or Male 24 oz. Female 17 oz.				
	Left 441 "	" 21 "	" 15 "		
Total	954 "	" 45 "	" 32 "		
Liver	1610 grams				
	Width of right lobe,		18-20	cm.	
	" " left "		8-10	"	
	Length of right lobe		20-22	"	
	" " left "		15-16	"	
	Greatest thickness		5-9.5	"	
Ovaries	7.0 grams	4.5 x 2.7 x 1.3			"
Pancreas	66.0-102 "	19 x 2.2 x 4.0			"
Spleen.	171 "	12 x 7.5 x 3.7			"

Suprarenals,	4.8-7.3 grams,	4.5 x 2.8 x .05 cm.	
Spinal cord	33.98 "	44.8 cm.	Male
		41.6 "	Female
Stomach,	170.232 "		
Testes	15.24.5 "		
Thyroid	30-60 "	6 x 3.5 x 2.0 cm	
Uterus	110 "	9 x 6 x 3.5	" in those who have borne children

THE END.

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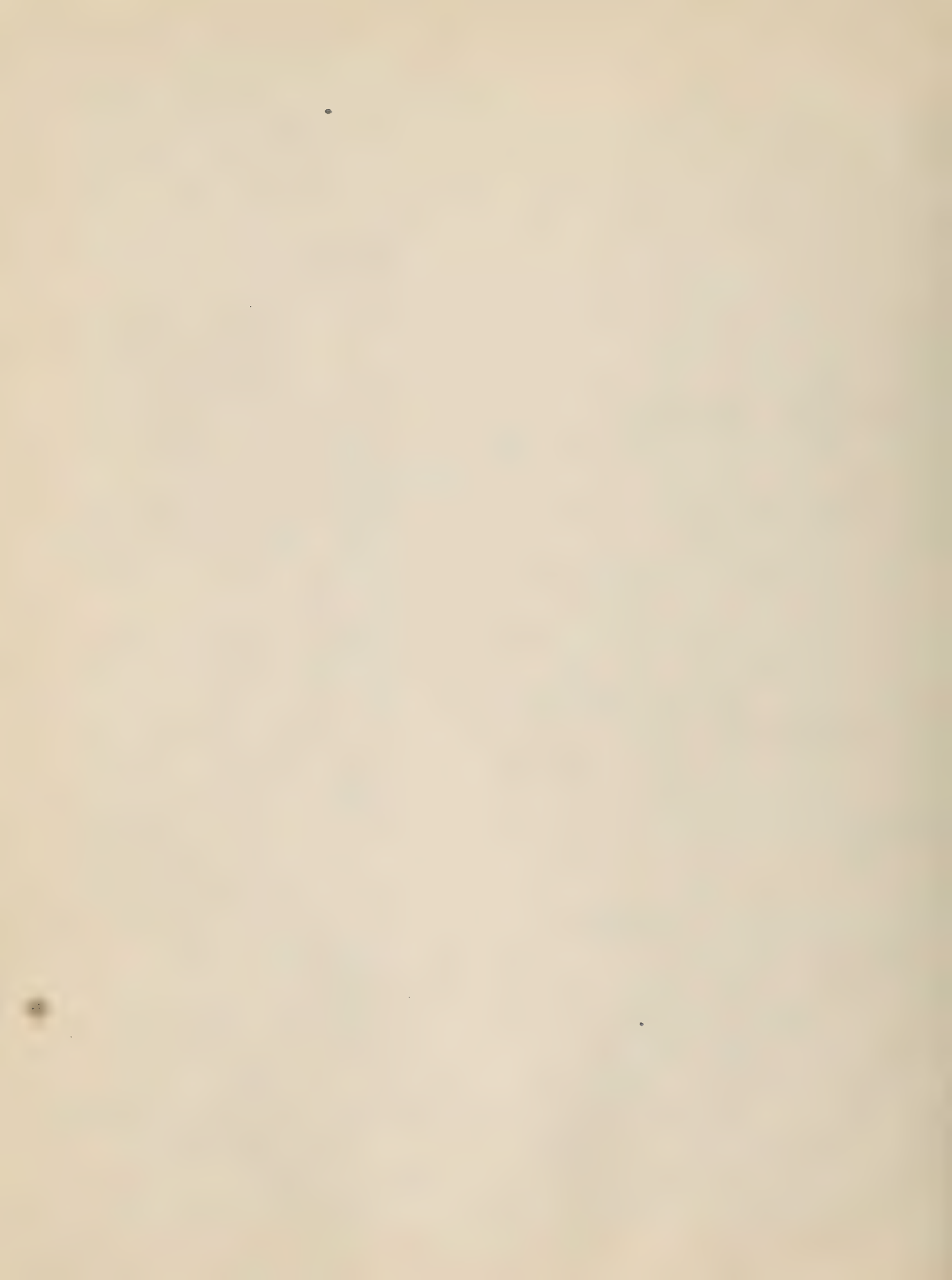
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